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## Oil Shale and Cannels

THE Institution of Petroleum Technologists is to be congratulated upon convening a conference to discuss oil shales and cannels and the retorting and refining industry that has been based upon these raw materials. Both oil shale and cannel can be retorted to produce oil, but the two materials must not be confused. Cannel is essentially a form of coal which may contain from 1 to 50 per cent. of ash, whereas oil shale appears to be a rock which has become impregnated with bituminous matter, generally containing algae, spores, macerated plant debris and fish remains, the oil yield appearing to be derived mainly from the algae.

Cannel coal was greatly in demand for gas making up to some 30 or so years ago, and the best cannels commanded high prices. Cannel coal yields a large quantity of gas of high illuminating power, and the introduction of the Welsbach mantle about the year 1895 struck the death-knell of this material as an article of commerce. In 1865, the quantity of cannel mined in Scotland was 322,000 tons, and in the whole of Great Britain was 1,420,000 tons; in 1935 the total Scottish production of cannel coal was just 734 tons, and there had been a similar decline in all parts of the country. A paper was submitted to the conference by Mr. Jamieson and Dr. King suggesting that a use might still be found in the gas industry for certain cannels, but there seems little likelihood of any pronounced demand. Cannel used for oil production is in the same category as oil shale, but from the production figures it appears that very little is used for this purpose, though there was once, for example in Staffordshire, a flourishing distillation industry based on cannel coal.

If the history of the shale oil industry in this country has not been quite so depressing, it is nevertheless true that there have been serious difficulties leading to a general decline. The industry was started in Scotland by Young because a refinery which he built to treat petroleum that was seeping from a colliery at Alfreton had failed owing to the disappearance of the raw material. The industry as a whole, however, had originated some years earlier probably as a result of work by Von Reichenbach in 1833, which induced Laurent to experiment on the distillation of shales and Selligue to work up the tar. Selligue and De la Haye

produced tar from these shales at Autun and worked it up commercially into light oils, lamp oil, heavy oil and paraffin, which products were shown by them at the Paris Exhibition of 1839. The output of Scottish oil shale increased progressively from 423,422 tons in 1865 to a maximum of just under 3,000,000 tons in 1915, but has diminished to 1,460,000 tons in 1937. It would not, however, be correct to suppose that the industry has had a steady increase to maximum prosperity, followed by an equally steady descent into the abyss. In an old work on the subject published by Dr. Scheithauer in 1913 it is remarked that "the difficulties with which this industry (Scottish shale oil) has had to contend may be gathered from the fact that out of 117 works which have been established at one time and another, only six are in operation, the others having succumbed to unfavourable circumstances."

It is perhaps an unfortunate oversight that no single paper presented to the conference deals with the economics of the shale oil industry. Had such a paper been presented it could have pointed out the progressive improvements that have been made in the industry to reduce costs in order to meet competition, many of these dating from the period 1870 to 1880. The continuing competition from imported oil which began in 1863 reduced the value of the products, but until some 20 years ago, technical improvements enabled the industry to continue in operation, although with diminishing profits, the difficulties that met those companies not organised for research being shown by the quotation from Dr. Scheithauer's book. The intense development of the petroleum industry would, however, have been too much for the shale oil industry had it not been for the tax on petrol and later on diesel oil. The value of the preference during 1936 to the shale oil companies was no less than £660,000, a figure in excess of the companies' total wage bill, but notwithstanding that the industry is being run on the most efficient lines, even with this subsidy the profit which is being earned is very moderate in relation to the capital employed. It is the old story of an old-established industry being slowly crushed out of existence by new discoveries and new methods. In this instance, however, the industry has fought very hard for its continuance, and the present outlook appears hopeful.

*"Discovery, gradual as it may be, will cause a certain amount of distress and dislocation in the established order of things. In order to minimise this dislocation we must be constantly preparing for what is to come by an intelligent estimation of what is likely to result from scientific discovery."*

—G. A. Laurence.

## Notes and Comments

### Scientific Agriculture

THE aims of industrial science are manifold, but in general they are concerned with the reduction of costs, the improvement in quality, and the increase in consumption. It is, incidentally, a curious commentary on modern civilisation that we should endeavour by every means in our power to promote the greater use of the raw materials of the earth. Where those raw materials are the result of the natural processes of organic growth, and can be replaced generation by generation as they are consumed, there can be no objection to this endeavour, but where, as in the case of coal and other minerals, the material used is non-replaceable, economic science and physical science appear to act in opposition. In agriculture we are dealing with materials that are replaced periodically by organic growth and thus increase in consumption is laudable. There was a feeling some years ago, perhaps it is now a couple of generations ago, that so long as output was high, it did not very much matter how an article was used—or wasted. Wastage, in fact, was approved by the producer. To-day we have learnt better.

We know that, in the words of a recent speaker who was dealing with the coal trade, "if the aim of scientific agriculture was to make two blades of grass grow where only one grew before, the aim of scientific salesmanship is to make one ton of coal do the work of two tons." This would be true of many industries, for a major difficulty is to promote consumption in a market which is demanding lower prices than the producer can afford to take. In other words, price is becoming supremely important, and particularly so for commodities that are produced in bulk.

### The Scientist in Agriculture

WHAT is the rôle of the scientific man in agriculture, and in what direction can he be most usefully employed? A survey of the field suggests that agriculture in 1938 thinks as did the rest of industry thirty years ago. The scientifically trained man is a curiosity, to be housed in institutions of one kind or another, or to be brought in to wave a wand over the troubled land, but not to be used in day-to-day production. There have been complaints recently in the Press that graduates in agriculture experience difficulty in getting employment and in some quarters this has been ascribed to the suspicious attitude of farmers who are distrustful of new methods. Precisely this attitude has been noted in the case of many other industrialists.

The outlook of the modern farmer, however, has changed fundamentally. The Department of Scientific and Industrial Research has taken farming under its wing and many agricultural colleges and research institutions up and down the country are engaged in valuable work. On Saturday last, Mr. W. S. Morrison, the Minister of Agriculture, opened an extension of the Agricultural Economics Research Institute at Oxford, which provided extra library accommodation, six extra rooms for research and a room for calculating machines. This institute was started in one room in 1913 and has since grown considerably until now it has a staff of 26. Mr. Morrison said in his opening speech that no industry had so vitally made use of research as agriculture; the change of attitude on the part of the Nation and the Government alike towards agriculture was of tremendous importance and would persist.

### Why Not Co-operation?

WE are inclined to believe that the employment difficulty which is facing industrial graduates is that individual farmers cannot afford to pay the salary which a man with graduate qualifications might reasonably expect. There is a sufficient number of well-paid places under the Government and under county councils to warrant a man's looking upon private employment in agriculture as a stepping stone to official employment later on. This means that unless well paid a graduate is always tempted to be on the look-out for a position worthy of the education which it has cost him both time and money to achieve. Further, this fact of his superior education is not likely to be absent from his mind and may make him difficult to handle as an employee, though this point should not be unduly emphasised since scientific knowledge is becoming every day more widely spread among agriculturists.

The solution of the problem might well consist in setting up all over the country a number of agricultural consultants who might advise the farmer in regard to his land and crops in much the same way as the veterinary surgeon looks after his animals. We can well imagine that ten or more farmers in one neighbourhood could each afford to pay the consulting agriculturist an average annual sum of, let us say, £100 a year, which would give them the benefits of all the scientific advice they are likely to need. In tentatively suggesting this scheme to the Minister of Agriculture and to the farming community in general we recognise that we are not farmers; but we remember how close is the connection between farming and the chemical industry. The chemical industry is deeply concerned with the prosperity of farming and is exceedingly anxious that farmers should make use of the resources which modern chemical industry can put at their disposal.

### The Trend of Trade

M. R. OLIVER STANLEY, in the House of Commons last week, made the admission that there has been a decline in business. Undoubtedly, 1937 was a peak year, and it was a time when deliveries were difficult in many materials because orders were greater than the level of production. Just how far new sources of production have been put into commission that cannot now be kept busy is difficult to say. There is a testing time ahead in some industries that have expanded to meet a peak, rather than an average demand. It would be wrong, however, to talk of a trade recession or to forecast another depression. There has, it is true, been a slackening in employment, a slowing down in the postal receipts and in the volume of goods carried by the railways. The coronation had an effect upon retail trade that must give the illusion of slackening this year, whatever may be the truth of the matter. Last year the value of imports and exports was higher than at any time since 1930, and in volume exports increased more than imports. One of the difficulties of the situation is the lack of stability in prices. A year or so ago prices soared to levels which were clearly too high. To-day the tendency is for them to drop too low. It would surely help to stabilise trade if some arrangements could be made to stabilise prices. Something to that effect has been done in the iron and steel industry, and producers are making an effort throughout the whole country to prevent violent fluctuations in the price of coke for general purposes. Much good might be done if other industries could follow suit.

## Accomplishments at the Soybean Laboratory\*

By HENRY G. KNIGHT,  
(United States Bureau of Chemistry and Soils)

THE soybean has been an important crop in China and Japan for thousands of years. It has been known in the United States for more than 100 years, but it is only within the past decade that this legume has assumed an important position in the agricultural and manufacturing industries.

In 1934 approximately 5,994,000 acres were planted to soybeans, but by 1937 the acreage had jumped to almost 7,000,000. In 1925, 5,000,000 bushels of beans were harvested; in 1934, around 23,000,000 bushels; and in 1937, more than 40,000,000 bushels. There are at present approximately 35 mills crushing soybeans, 15 plants engaged in the manufacture of soybean flour, 20 in the manufacture of soybean food products, and more than 50 in the manufacture of other industrial products. While only 2,646,000 lb. of soybean oil were produced in the United States in 1926, it is estimated conservatively that the crush from the 1937 crop may exceed 200,000,000 lb., which is more than twice that of 1934. The production of soybean meal has also been greater. It can be realised readily that the large increase in soybean acreage and the enormous jump in oil and meal production have created actual and potential problems of considerable importance to the industry. It would, therefore, seem to be the part of wisdom to develop a research programme which might anticipate and solve these problems and assist in placing the soybean industry, in all its phases, upon a sound and stable basis.

There are five reasons for the rapid increase in soybean production: greater demand for soybean oil, oilmeal, and food products; drouth resistance of the soybean plants; immunity of the soybean to chinch bugs and other pests; good prices compared with other grain crops; high yield of seed.

### Data on Oil and Protein Content

Almost half of the 23,000,000 bushels of seeds produced in 1934 were used in making oil, oilmeal, and in the manufacture of soybean flour and other foodstuffs. There has been a large increase in the use of soybean seed for industrial and food products, such as paints, enamels, varnish, glue, printing ink, linoleum, plastics, shortenings, margarine, foundry cores, livestock feeds, flour, soy sauce, dietetic foods, infants foods, beverages, and so on. The laboratory is needed to make chemical investigations into the rapidly growing use of soybeans for industrial purposes, and to check on the varieties of beans to make sure the farmer is raising the best variety for his soil and his pocketbook, as well as for the new industry. Uses of soybeans for industrial purposes have developed so rapidly in the last decade that more information is needed about the chemistry of beans and the chemical and physical properties of their constituent materials. More data are required on the oil and protein content of different varieties—more information about the composition and properties of the proteins, phosphatides, oil, minerals, and carbohydrates.

The processing industry prefers beans high in oil and protein. The same varieties of soybeans produced under different environments often vary from 16 to 26 per cent. in oil, and from 28 to 55 per cent. in protein. We ought to know, if possible, what causes this variation. There is also need for research work on phosphatides, a valuable product of soybean oil used in the manufacture of candies, chocolates, medicines, textiles, and so on.

The soybean industry is becoming so large and has made so much of its growth in such a short time that it needs the co-operation of all interested to bring research in chemistry and plant breeding in balance with the increased production and utilisation of soybeans. This, briefly, is the background for the establishment in 1936 of the Regional Soybean Industrial Products Laboratory at the University of Illinois at Urbana. The laboratory is regional in its outlook and represents a co-operative effort, participated in by the Bureaus of Chemistry and Soils and Plant Industry of the United States Depart-

ment of Agriculture and the Agricultural Experiment Stations. The broad objectives of the laboratory are to ascertain the effects of varietal and cultural differences on the chemical composition of the soybean and to develop new industrial outlets and improve present industrial uses for soybeans and soybean products. The research programme laid down to achieve these objectives is planned by representatives of the federal and state agencies named above, and approved by their chiefs and directors.

### Variables in Chemical Composition

The chemical work of the laboratory is organised under four sections—analytical, oil, meal, and development—and is administratively in charge of the Bureau of Chemistry and Soils. The agronomic work dealing with the cultural and genetic phases of soybean research is administratively in charge of the Bureau of Plant Industry. It is not planned to do any work relating to the use of soybeans or soybean meal as a food or feed. These problems are being studied in the various State Experiment Stations, in university and other governmental laboratories.

The agronomic investigations include experimental soybean plantings. During 1937, 43 experimental plots were planted in six states included in the above geographical range, and many of these plots were sub-divided to provide for varietal and fertiliser studies. A number of plant breeding studies was initiated during the past year, which it is hoped will lead to developments which eventually will make it possible to ascertain trends in the inheritance of oil and protein content and in other variables in chemical composition of the beans derived from the resulting crosses. In addition, facilities have been set up to carry out physiological studies of the soybean. In connection with the experimental plots mentioned above some progress has already been made in relating certain aspects of chemical composition to varietal and environmental factors. However, analytical results on the composition of beans derived from experimental plantings in 1936 and 1937 are still too meager to permit any conclusions to be drawn at this time. Such investigations must, of necessity, be carried out over a period of years before it is wise to attempt to draw conclusions upon which a programme involving varieties and cultural conditions may be safely based.

More than 500 samples of soybeans derived from these experimental plots have been analysed thus far. In addition to these analyses, the analytical section of the laboratory has carried out studies of the distribution of phosphorus compounds in soybean seed, and has also investigated the effects of physical factors on the dispersion of soybean proteins in water. It is now completing investigations on the solubility of soybean proteins, lecithin, and sugars in alcohol-water mixtures.

### Soybean Oil Varnishes

Considerable experimental work has been done in the oil section of the laboratory during the past year on the development of soybean oil protective films and coatings, with especial reference to 100 per cent. soybean oil varnishes. A large number of experiments dealing with variations in resins, driers, methods and duration of bodying, and types of soybean oil have been carried out and have led to the development of several varnishes of considerable promise which are characterised by the use of clarified, nonbreak, or alkali-refined soybean oil, synthetic and ester-gum resins, and cobalt driers. Varnishes are undergoing exposure tests and are standing up exceedingly well with practically no checking, and with excellent retention of gloss. The acid, alkali, and water resistance of many of these soybean oil varnishes is excellent. While not so rapid drying as many of the varnishes developed

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in recent years to meet the very stringent drying requirements now specified for some uses, it is felt that the excellent durability and other characteristics of these soybean oil varnishes more than justify their use for certain purposes in their present state of development.

A complete apparatus for molecular distillation has been set up, which includes two pot stills and a column type still. Several runs have been made with soybean oil in these stills, and they have functioned very satisfactorily and offer considerable promise as tools for investigations of composition and characteristics of soybean oil.

Extensive studies are under way in the meal section of the laboratory concerning the properties of water dispersions of nitrogenous compounds of soybean meal. It has been found possible to disperse from 90 to 95 per cent. of the nitrogenous material of defatted soybean meal by distilled water, and investigations have been completed of the effect of hydrogen ion concentration and salts on the behaviour of these dispersions. The results of this research will be published in the near future. Important progress has been made in the development of interesting plastic materials from soybean protein. Investigations by the meal section have disclosed that soybean protein can be treated with formaldehyde solution, dried to a powder, and moulded in a die as long as the moisture content of the material is at least 5 per cent. The resulting product is tough, hornlike, transparent, of a yellowish brown hue, does not warp or crack, and may be pigmented to give colours ranging from grays to blues. It may be plasticised fairly satisfactorily with glycols. There is considerable work yet to be done on these plastics derived from soybean protein, as they have a tendency to become brittle with age, and water absorption, although low for such a material, is still thought somewhat excessive for the plastic to be of general utility.

#### Pressing and Solvent Extraction

Pilot plant expeller press equipment and an experimental solvent extractor have been set up in the development and engineering section, to be used in investigations of soybean processing. Several experimental runs have been completed with the expeller press. It is hoped to establish definitely the effect of such variables as soybean variety, particle size, moisture content, temperature effects, and the like on the quality and quantity of oil and meal produced in pressing and solvent extraction operations.

Co-operative research projects have been set up with the Purdue University Agricultural Experiment Station which deal with the investigation of sterols, phosphatides, and carbohydrates of the soybean, and with the University of Minnesota Agricultural Experiment Station which deal with the study of the respiration of soybeans when stored under certain conditions of moisture content, humidity and temperature. The work completed in the short time under which experimental investigations have been under way emphasises that the prospects are bright for further industrial use of soybean products. Broadened applications in industry for soybeans, however, will require more precise knowledge of the physical and chemical properties of the materials derived from soybeans.

### Oil and Colour Chemists

#### Past Year's Work Reviewed

THE twentieth annual general meeting of the Oil and Colour Chemists' Association was held following an informal dinner at the Palace Hotel, Bloomsbury Street, London, W.C.1, on Friday of last week. Dr. G. F. New (retiring president), occupied the chair.

The annual report for the year ended May, 1938, which was adopted, refers to the Council's decision that, at any rate for the present, the conference should be held bi-annually. In 1937 the London Section was formed, as a natural and logical sequence the report states of the Association's development.

Inasmuch as the London Section will now have its own governing body, the Council and officers of the Association will be free to give their complete attention to the more general affairs of the Association, leaving detailed work in London in the hands of the officers of the section. There are also sections in Manchester and in Scotland. The total membership at May 6 was 602.

During the past year the Association has collaborated with the Society of Chemical Industry as in previous years, in the preparation of "Reports of the Progress of Applied Chemistry." The Association is represented on the British Standards Institution's Paint, Pigment and Varnish Committees, by Mr. C. A. Klein (past president), and the report particularises the work done by that committee.

The Association has continued its co-operation with the City and Guilds of London Institute, being represented by Mr. C. W. A. Mundy on the Advisory Committee on Pigments, Paints and Varnishes. Mr. Douglas Wait, a member of the Council of the Association, has been appointed the Institute's examiner for the 1938 examinations, in succession to Dr. H. Houlston Morgan, a past-president of the Association. Dr. New and Mr. T. Hedley Barry have represented the Association on the Parliamentary Science Committee, which has been responsible for drawing the attention of the legislature to the importance of adequate scientific representation on many Government Committees and Commissions and for raising scientific and technical matters in the House.

#### The Patent Office Library

This link with the Government is proving increasingly valuable and influential. A special committee of the Parliamentary Science Committee, on which the Association's representative served, has prepared a report on the library service of the Patent Office. The report was laid before the President of the Board of Trade, who received a deputation on the subject and assured the committee that its representations would receive sympathetic consideration.

Draft new rules for the government of the Association were adopted. They have been made necessary mainly by reason of the formation of the London section, and the opportunity was taken also to bring the rules up to date.

Officers elected for the year 1938-39 were as follows:—President, A. J. Gibson; vice-presidents, G. N. Hill, S. T. Kinsman, A. L. Matthison (president, Paint Federation), G. F. New, S. K. Thornley (president, Paint Research Association); hon. secretary, C. W. A. Mundy; hon. treasurer, H. D. Bradford; research and development officer, W. E. Wornum.

As the result of the ballot for the election of members of the council to fill four vacancies, the following were elected:—Mr. T. Hedley Barry, Dr. H. W. Keenan, Mr. K. McKenzie Richards and Mr. D. Wait. Mr. M. E. Dougherty was re-elected hon. auditor.

### Oil Refining in Britain

#### Rise of 14,100,000 Gallons in 1937

THE throughput of mineral oil refineries in Great Britain in 1937 rose by 14,100,000 gal., according to the *Board of Trade Journal*. The total was 621,100,000 gal. against 607,000,000 gal. in 1936. In 1935 the total was 573,400,000 gal. The larger proportion of the material treated at the refineries consists of crude petroleum as it comes from the wells, but substantial quantities of other kinds of imported petroleum such as distillates, kerosene and heavy oil residues are also subjected to further refining.

The output of liquid products totalled 459,100,000 gal., as against 441,000,000 gal. in 1936, of which 197,700,000 gal. were fuel and diesel oil, as compared with 170,800,000 gal., while 118,200,000 gal. were motor spirit, as against 125,200,000 gal. The output of solid products in 1937 was 567,882 tons, as compared with 552,038 tons in 1936 and 491,041 tons in 1935.

## Oil from Shale and Cannel Coal

### Institution of Petroleum Technologists Hold Conference at Glasgow

THE utilisation of oil shales and cannel coals in connection with the production of synthetic oils, was outlined by Dr. A. J. V. Underwood, M.I.Mech.E., F.I.C., in one of the papers presented at the conference on oil shale and cannel coals at Glasgow this week.

The carbonisation of oil shales and cannel coals produces, in addition to the oils or oils and gas which are the primary object, a solid residue of coke. The large-scale developments in recent years in the production of synthetic oils by the Bergius hydrogenation process and the Fischer-Tropsch process have directed attention to the possibility of employing these processes to utilise the carbon in the residue from the retorting operation. The residue from oil shales has too high an ash content for it to be utilised in this way. The only possibility of combining the carbonisation of oil shale with a synthetic process occurs in South Africa, where torbanite necessitates the simultaneous mining of coal, which is a suitable material for the Fischer-Tropsch process.

#### Treatment of Cannel Oil

Considering an average cannel, and assuming that 100,000 tons of tar per year are produced for hydrogenation, the cannel required would be 530,000 tons a year and, after using the coke required to produce steam, power and hydrogen for the process, there would be a surplus of 160,000 tons of coke a year to be disposed of elsewhere. If half this amount of cannel were carbonised and 50,000 tons of tar or tar oils were purchased from outside, the whole of the cannel coke would be utilised in the process. The purchase of this quantity of tar or tar oils suitable for hydrogenation would probably present serious difficulty. If the carbonisation of cannel were combined with a Fischer-Tropsch plant producing 30,000 tons a year of synthetic oil and using 150,000 tons of sized coke, there would be required 330,000 tons of cannel per year and there would be a surplus of 50,000 tons a year of coke breeze unsuitable for producing the water gas required for the process. For this scheme low temperature carbonisation of the cannel would be preferable to high temperature carbonisation as it would produce less pitch and tar acids. The value of the pitch and tar acids, moreover, is a factor requiring investigation.

The treatment of the cannel oil in conjunction with the Fischer-Tropsch oil, by cracking or by distillation, would also require considerable investigation, continued Dr. Underwood. The combination of carbonisation with both a hydrogenation plant and a Fischer-Tropsch plant would permit of all the coke being utilised if the coke breeze were not greater than the amount required for steam and power production and the amount of sized coke were sufficient for the production of hydrogen for the hydrogenation plant and synthesis gas for the Fischer-Tropsch plant. The amount of coke breeze formed would therefore be a vital factor.

#### Carbonisation in Gas Retorts

The practical possibilities of any of these schemes can only be determined when certain fundamental technical questions have been investigated, such as the availability of suitable cannel in the quantities required and the suitability of the coke for water gas production on a large scale. A further possibility, which does not yet appear to have been examined, is the treatment of cannel by extraction processes such as the Pott-Broche and Uhde processes to furnish a suitable material for treatment in an existing hydrogenation plant without raising the problem of disposing of large quantities of residual coke.

A paper by J. Jamieson, engineer and manager of the City of Edinburgh Gas Department, and Dr. J. G. King, of the Fuel Research Station, described experiments upon the carbonisation of Newcastle cannel in continuous-vertical gas re-

torts which show that lump cannel could profitably replace bituminous coal for gas-making purposes. Cannel of good quality contains potentially two or three times as much tar or oil as bituminous coal, and the carbonisation of cannel for the production of oil could be immediately applied in the existing industry of gas manufacture, the gas and by-products being suitable for existing markets. Under gas-making conditions, cannel gives about 80 per cent. of its potential yield of oil in the form of a thin tar. Even if this tar is valued at as low a price as 2d. per gal., the cost of production of the gas compares favourably with town's gas made from bituminous coal.

Tar may be converted into marketable oils and other products by (a) distillation, (b) cracking and distillation, or (c) hydrogenation-cracking. Comparative yields calculated per 100 gallons of tar would be as follows:—

	Shale Samples.		
	(A)	(B)	(C)
Motor spirit, including gas spirit gal.	12	21	36
Diesel oil	" 24	11	67
Fuel oil	" 27	5	nil
Paraffin wax	lb. 58	nil	57
Pitch	" 390	390	nil

The motor spirit from shale A would be classed as grade 1; the "diesel oil" would be suitable only as a blend constituent. Distillation of the tar would therefore yield 5.7 gal. of motor spirit and 21.30 gal. of diesel oil per ton of cannel. Cracking would increase the yield of spirit by about 4 gal. and decrease the yield of oil by 15 gal. Reduction of the temperature of carbonisation does not lead to higher yields of oil. Direct hydrogenation would give much higher yields, but cannel offers no appreciable advantage over bituminous coal from the hydrogenation process. These yields of oil appear to justify the careful separation of cannel during mining, and its separate treatment in continuous-vertical-gas retorts, the crude tar being treated at present by distillation in the absence of available hydrogenation plant.

#### Assessing Oil Shales and Cannels

R. A. Mott and C. E. Spooner contributed a paper upon assessing the value of oil shales and cannels. They pointed out that it has been shown that the oil-yielding ability of oil shales and cannels like that of coals, is dependent on the hydrogen content of the organic matter present. Hydrogen combined with oxygen as water of constitution of the inorganic matter is deducted by correcting to the Parr dry, mineral-matter free basis. On this basis the total oil yield obtainable from oil shales and cannels, as from coals, in a laboratory low temperature assay is:—

$$\text{Oil per cent.} = 10.3 (H - 4.20)$$

This formula has been used to assess the extent to which secondary decomposition occurs in the practical retorting of oil shales, where the yields, often as high as 90 per cent. of the theoretical, are sometimes only 65 per cent. Attention is drawn to the greater importance of time of contact of the oil vapours in the heated retort than actual temperature in causing secondary decomposition which is best avoided by reducing the "free space" to a minimum and by circulating steam or other "inert" gases. One use of the formula is to determine the efficiency of the means chosen to avoid secondary decomposition.

Since the determination of the hydrogen content of any material is difficult, it is shown that the oil yield may be calculated approximately from the volatile matter and the calorific value, or from the volatile matter alone if the oxygen content of the organic matter of an oil shale, cannel or coal is known. Assuming that the oxygen content of the organic matter of an oil shale in one deposit remains constant, the volatile matter test may be used as a means of assessing variations in oil-yielding ability in different parts of the deposit.

The retorting of oil shales in Scotland was described by D. Stewart and C. E. Forbes, who said that the Scottish shale oil industry really came into existence in 1851 when J. Young, Meldrum and Binney started a works at Bathgate, West Lothian, for the distillation of the rich boghead cannel coal which was mined locally. Within ten years, however, the supply of this coal became exhausted and the industry has since then been carried on with oil shale, the existence of which was discovered in the Broxburn area a few years before.

The earliest retorts were horizontal, but within a few years of the start of the industry, vertical C.I. retorts were introduced. These were operated continuously, the oil denuded shale being withdrawn at regular intervals from the base through a water seal. Steam was introduced during distillation and a better yield of oil was obtained with a definite economy in fuel. During the last 35 years of the 19th century many different forms of retort were proposed or tried out. Two of special historical interest were (1) the Henderson retort of 1873, which made use of the residual free carbon of the "spent shale" as a fuel for heating the retort settings, and (2) the Pentland retort of 1882, which doubled the yield of ammonium sulphate while still further improving the oil yield as compared with older retorts. The principle of the Pentland retort was incorporated in the modern continuous Scottish shale retort of which the Pumpherston or Bryson design has proved itself to be one of the most economical and efficient.

All the shale retorts now in use in Scotland consist essentially of a firebrick retort surmounted by a cast iron section, the whole being heated externally by permanent shale gas. Steam is injected into the retort, and this, besides aiding the distillation of the shale, enters into combination with the nitrogen and carbon of the oil denuded shale in the hotter part of the retort to produce ammonia and combustible gas.

#### Shale Oil Retort Types

Within the last few years many alternative forms of retort have been studied, but none has shown promise of improving on the present type. In a fuller investigation of the present type, however, with a view to increasing its daily throughput, it was found that the heat input to the shale could be greatly increased by permitting partial combustion of the residual carbon of the shale in the lower part of the retort. By supplementing the externally applied heat in this way greatly increased throughputs have been found possible without loss of oil yield, but with slight loss of ammonia. The principle was developed first on a single retort then on small experimental benches, and has now been applied to two complete benches of 40 retorts each in which each retort is dealing with 10 tons of shale per day.

Particular aspects of the refining of shale oil in Scotland were dealt with by G. H. Smith and W. B. Peutherer. In the early days of the industry burning oil was the main objective of the refiner, but as the industry developed, the refining of shale oil aimed at the production of a full range of products—motor spirit, solvent naphtha, burning oil, gas oil, wax, light lubricating oil and fuel oil. Such processes have already been adequately described and the authors dealt with what are to-day the most important products—diesel oil for high speed compression ignition engines, motor spirit and wax.

In the case of diesel oil production, the various steps with possible modifications were discussed and experimental evidence was given in support of the conclusions arrived at. It was indicated that for this particular purpose atmospheric distillation of the crude oil is preferable to vacuum distillation, while liquid  $\text{SO}_2$  shows no advantage over sulphuric acid as a refining agent. In preparing diesel oil, it is essential to remove the wax from this material. Details of the operation of high pressure coolers and filter presses were given, together with a sweating scheme for crude wax based on the melting point of the oil-free wax in the various fractions and strainings. Acid and soda treatment of the crude scales and decolorisation of the separated waxes are dealt with.

To produce the maximum motor spirit from shale oil entails the removal of all the motor spirit from crude oil and cracking or hydrogenating the residue. By cracking under conditions for maximum spirit yield, crude shale oil gives 50/55 per cent. motor spirit and certain distillate fractions give more, as shown by experimental figures. The octane rating of the spirit so produced is low, but while this can be improved, yields will be correspondingly low.

The refining of shale spirits was discussed, with particular reference to the necessity for close control of the sulphuric acid and caustic soda treatments. The final plumbite wash, because of the presence of traces of phenols, introduces some novel features. Efficient treatment with caustic soda before, and with water after plumbite is essential to eliminate the possibility of traces of lead phenate appearing in the finished spirit.

#### Treatment by Hydrogenation

The treatment of shale oil by hydrogenation was the subject of a contribution by Dr. Ing. e. h. M. Pier. He pointed out that shale oils resemble in their properties both coal and petroleum oils. Low temperature carbonisation yields about  $\frac{1}{3}$  of the organic matter in the form of shale oil, which is considerably more than is obtained in the case of coal. The separation of ash and organic matter could also be carried out by other means, e.g., by extraction with high boiling solvents under pressure, which would result in an increased oil yield from shale. The direct hydrogenation of shale, e.g., in the liquid phase, as in the case of coal, might also be considered. By this means it is possible to achieve a practically complete conversion of the organic matter in the shale. Compared with carbonisation, the increased oil yield obtained by extraction and hydrogenation is, however, only to be achieved at the cost of a greater expenditure. The technical application of this process would only be taken into consideration if it offers distinct advantages in its final results.

The products obtained from shales by carbonisation are, in their properties, partly similar to mixed base petroleum oils, partly to brown coal tars and they require, as in the case of coal tars, refining to a much higher degree than petroleum oil products. In view of economisation of raw materials, and with respect to the properties of the final products, it would, therefore, appear that hydrogenation of shale oils is a particularly suitable method of processing. For the treatment of shale oils it is possible to apply, without alteration, the hydrogenation process which has been used with success on a large scale for coal, tars and oils.

Experiments for the treatment of shale oil in the liquid phase, with finely divided catalyst, have confirmed that the conversion of the heavy fractions in the middle oil and asphalts into oil may be carried out easily with high yields. Liquid phase middle oil from paraffinic shale oil can be employed directly as diesel oil. Liquid phase middle oils from asphaltic shales contain phenols, but they may be converted without difficulty into good diesel oils, for example, by a subsequent treatment over a fixed catalyst.

#### Refining Hydrogenation

All shale oils of medium boiling range, both distillation- and liquid phase-products, are suitable for the treatment in the vapour phase over fixed catalyst. By refining hydrogenation, only the phenols are reduced, with practically no splitting of the hydrocarbons, the unsaturated compounds are saturated and sulphur and nitrogen are removed, resulting in watertight light stable diesel oils of high cetene numbers. Their pour point is particularly low when asphaltic shale oils are treated, being below  $30^{\circ}\text{C}$ . Petrols obtained by destructive hydrogenation in the vapour phase correspond in properties to the best market petroils. Motor petrol can be obtained in a yield of more than 100 per cent. by volume of the middle oil fed, the octane numbers being between 65 and 67.

Treatment of low temperature carbonisation coal tars over fixed catalyst gives completely refined products without substantial change in the boiling curve and practically without gas formation. In this case the asphalts are completely converted.

From Scottish shale oil, in an exactly similar manner, an almost 100 per cent. yield by weight of hydrogenation product was obtained, which consisted of high quality gas oil, spindle oil, and machine oil with the characteristics of Pennsylvanian oil, and also paraffin. The gas oil is eminently suitable for the production of petrol, if it is subjected to hydrogenation with strongly splitting catalysts. A gas oil of this type gave a petrol with 95 per cent. yield by weight, having an octane number of 67 CFR motor method and high lead sensitivity at an end-point of 185° C. By cutting this petrol to an end-point of 152° C., the octane number was increased to 71, and by the addition of 0.09 vol. lead tetra-ethyl to 87.5.

Oil shale deposits or seams, which require a careful laboratory investigation, must needs be sampled with fairness, said W. R. Guy, A.I.C.C., because it is upon the results of the examination that much may depend. Among the general methods of testing oil shale can be classed such determinations as proximate and ultimate analyses, sulphur content, etc., but in the main the methods laid down for coal by the British Standards Institution can be adopted with very little modification. Of the methods used on the Continent in assaying oil shale for oil yield little is known, although for bituminous lignite it would seem that a glass retort heated by a gas burner and surrounded by a metal shield is used. In the German brown coal industry this type of apparatus is employed, as well as Fischer's aluminium distillation apparatus for coal.

In Great Britain, apart from the standard method in the Scottish shale oil industry, the only type of apparatus applicable to the assay of oil shale is the "Gray-King," as used at the Fuel Research Station for the assay of coal. Unfortunately, with the small quantity of raw material taken for test, an extremely small amount of oil is obtained. The Fuel Research Board have now, however, developed an apparatus taking 500 gm. coal, and the design of this is somewhat nearer the standard apparatus used by Scottish Oils, Ltd., for a number of years. The approximate quantity of spirit (scrubber naphtha) in the permanent gas can be obtained by leading the gas and light hydrocarbon vapours from the condensers on the oil assay apparatus through activated charcoal.

#### Potential Service of Motor Fuel

According to Dr. G. Egloff, J. C. Morrell and G. B. Zimmerman, shale oil represents a large potential source of motor fuel. The modern cracking process, described in some detail, was applied in pilot plant scale to the processing of a variety of shale oils and their fractions to increase the yield of motor fuel. A French shale oil from the Autun region yielded 6 per cent. gasoline on distillation. The remaining oil, on cracking, produced 49.3 volume per cent. gasoline with 45.6 per cent. residuum (fuel oil) and 69.1 volume per cent. gasoline with 24 weight per cent. coke. After treatment with sulphuric acid, the gasoline yield from the residuum operation was 46.6 per cent., having 62 octane number with 0.19 per cent. sulphur. From the coking operation the treated gasoline yield was 65.2 per cent., with similar properties. Three Fushun, Manchurian shale oil fractions, including the crude shale oil, fuel oil from coking distillation of the crude and a topped shale oil, were processed to produce gasoline with residuum or coke, and to produce gasoline and kerosine with residuum or coke. The gasolines were then treated with sulphuric acid and the kerosines with liquid sulphur dioxide to produce finished products.

Experimental work carried through by the United States Bureau of Mines on the production of oil from oil shales in the United States, was described by A. J. Kraemer. Two retorts, the Pumperston and the N.T.U., which were already known in connection with retorting of oil shale were selected, as it was decided not to spend time and money on plant design. The Pumperston retort was a single unit of the type which had been operating successfully in Scotland for many years. The N.T.U. retort, otherwise known as the Dundas-Howes, differs from the Pumperston retort in that it is of the intermittent or "batch" type.

The tests on the Pumperston retort were carried through, using steam in the process, but not admitting air. The conditions of retorting were varied in the experiments, and it was concluded that: (1) the yield of oil was high, a quantity of ammonia liquor, and an excess of gas for heating the retort were obtained when using non-coking shale; (2) coking or shales which intumesce will plug the retort; (3) the capacity of the retort was not limited to 96 gal., as stated by Gavin (Bureau of Mines Bulletin 210); (4) the retort appeared to be capable of a sustained yield of 225 U.S. gal. of oil per day, when charged with 35 to 36 gal. shale.

The N.T.U. retort was operated in a different manner from the Pumperston retort. Combustion was induced in the shale charge and a mixture of air and exit gas drawn into the top of the retort and downwards through the shale. The results of the tests on this retort proved that: (1) the yield of oil was higher than that obtained in the Pumperston retort; (2) it operated successfully on coking or non-coking shale; (3) no ammonia was recovered.

#### The Pumperston Retort

The oil from the Pumperston retort was lower in specific gravity and contained a larger percentage of hydrocarbons distilling up to 275° C., but was probably of better quality.

The yields and character of the products obtained by experimental low temperature distillation of the more important Scottish cannels were reviewed by W. M. Cumming and H. B. Nisbet. It was recorded that the gas yield varied from 2,000 to 5,000 cu. ft. per ton, and contained 6 to 7 per cent. of olefines. A complete analysis of the gas indicates that it is suitable for cracking with steam to give a product which could be used as a "synthesis gas" for catalytic conversion to oil. The scrubber naphtha, extracted by active carbon, varied in yield from 0.74 to 1.84 gal. per ton with S.G. of 0.66 to 0.787. The crude oils, obtained in yields of 40 to 85 gal. per ton, were dark green to black in colour and were characterised by a high wax content (3 to 23 per cent.). They are paraffinic in nature and contained 4 per cent. of tar acids and 4 per cent. of bases. The solid residue, from the retort, varied from strongly coking to non-coking in nature.

A comparison of the small scale low temperature tests with the carbonisation of a  $\frac{1}{2}$  ton lot of cannel at the Fuel Research Station was given along with a more detailed account of the fractionation of the tar obtained in the latter test. The motor spirit fraction of this tar (0.56 gal. per ton) after refining had a low octane number of 58, but this could be raised to 68.5 by blending with half its volume of benzole with 2 mls. per gal. lead tetraethyl and 3 per cent. aniline it was raised to 74.5, although the former alone gave only 66. This spirit did not include the scrubber naphtha. The addition of 2 per cent. of ethyl nitrate to the crude diesel oil fraction (20 gal. per ton) lowered its S.I.T. from 431° to 285° C., but the cetene value was only 40. After dewaxing and refining with furfural, a light lubricating fraction was examined for suitability as a diesel oil or a light spindle oil. For the former purpose the oil shows definite promise, but, although the viscosity index is excellent, the low resistance to oxidation would probably condemn it as a lubricating oil.

#### Recycled Distillation

The use of recycled distillation gases in retorting oil shale was the subject of a paper by J. Teillard d'Eyr, who described a retort for the distillation of oil shales and similar non-caking materials, in which the distillation is effected by recycling the products of distillation through a heater and back through the mass of shale in the distillation section.

This retort is vertical, of rectangular cross-sections and consists essentially of four distinct chambers connected by ducts, through which the shale passes in its downward path to the spent shale discharge hopper. The shale is fed into the top chamber, in which the temperature is brought to approximately 200° C. by preheating with flue gas from the third chamber. In the second, or distillation, chamber the products of distillation are withdrawn by a blower and passed through a heat exchanger, specially designed to permit of easy

cleaning, and recycled back through this chamber, thereby bringing the temperature in the distillation zone to 430 to 450° C. From this circuit is withdrawn, to the cooling and condensing system, a quantity of gas equivalent to that formed in the distillation. The shale then passes to the third chamber, where the residual carbon is burned and the products of combustion forced through the heat exchanger which heats the gases recycling to the second chamber, and from there this flue gas passes to the preheating section. The shale then falls into the fourth chamber, where it is cooled by water injection and discharged.

It is claimed that by this method of distillation the shale is heated by direct contact with gas, but at the same time the quantity of gas produced is kept to a minimum in comparison with other retorts of this type, wherein the distillation gases are diluted with combustion or inert gases.

It has been successfully demonstrated that British cannel coals can be treated with the greatest ease in the Davidson rotary retort said T. M. Davidson, M.I.Chem.E. Thus, Welbeck cannel gave an oil yield of nearly 57 gal. per ton, and the residual smokeless fuel had a volatile content of about 5 per cent. When treating bituminous coals, the solid fuel is manufactured in spheroidal shape, the coke-balls being formed by the rolling motion induced by travel through the retort. In this process, blending of coking and non-coking coals is generally practised, the nature and characteristics of the coals used determining the character and properties of the coke-balls made. This fuel is of fairly high volatile content, but burns with complete absence of smoke.

In a new type of rotary retort which is now undergoing trial, bituminous coal is treated on the external surface of a long rotating tube in such a way that carbonisation is completed in a single revolution of the retort and a good solid fuel produced.

## Low Temperature Carbonisation

### Tests on Morgan Rotary Retort

A REPORT published by the Department of Scientific and Industrial Research (Stationery Office, 9d.) gives the result of a test by the Director of Fuel Research on the Morgan rotary retort installed at Rodridge Hall, near Wingate, Co. Durham. The test was carried out under powers conferred by the Government, whereby the department may test low-temperature carbonisation plant at the public expense, subject to certain conditions. The object of these tests is to place in the hands of those interested, accurate technical data on the quality and quantity of the yields, the throughput of the plant, the working temperatures, etc., and the general ease of working. No attempt is made to pronounce on the commercial possibilities of the plant, for these can only be judged after working at steady load for long periods and in the light of complete knowledge of local conditions of prices, markets and costs.

The plant reported upon is of intermediate-scale size, and deals with a throughput of about 4.6 tons of coal per day. Although not intended for commercial operation, it is considered to be large enough to yield data capable of being interpreted directly in terms of a commercial-scale unit treating about 30 tons per day.

The object of the process is stated by the inventor (Mr. J. S. Morgan) to be the production of low-temperature coke, primary tars, and a gas of high calorific value. It is not intended to market the coke for domestic purposes, but to use it—either on chain grate stokers or in pulverised form—for steam raising, or for other industrial purposes. Similarly, the gas would also probably find industrial outlets.

The retort is a mild steel drum of 5 ft. diameter and 3 ft. in length, lined with fire brick and having an internal grate. The axis of the retort is horizontal, and the retort is rotated only during the carbonising periods. At the end of a carbonising period, the retort is stopped with the grate in the lowest position, and air is blown through the coke bed. A charge of about 80 lb. of coal is then added, the retort is

rotated, and carbonisation is carried out by the sensible heat of hot coke. Steam may be admitted during the last part of the carbonising period, in order to remove the residual coal gas from the retort.

With coal of a suitable nature the coke spills over automatically to a predetermined level during the rotation of the retort, but should this not occur it is blown over during the subsequent air blow, which raises the temperature of the coke remaining in the retort sufficiently to carbonise the next charge. The cycle of operations adopted during the major part of the test was as follows:—Air blowing, 1½ minutes; charging, 30-60 seconds; carbonising, 4 minutes without steaming, or 1 minute with steaming; change over period, 30 seconds.

In the experimental plant tested, this cycle is carried out without the assistance of any automatic devices, and a considerable amount of manipulation of valves, switches, etc., is necessary. It is pointed out in the report that in a commercial plant, whether of the size tested or larger, the necessary operations could be performed by simple mechanisms, with a saving in time and in the cost of labour.

The claimed throughput of the retort is from 4 tons of coal per 24 hours with a strongly-caking coal to 6 tons with a non-caking coal. During the test, which lasted two days, a strongly-caking Durham coal was used, and the throughput was 4.1 tons per day. During this period 220 complete carbonising cycles were carried out.

Following a detailed account of the design and operation of the plant, the report describes the arrangements made for measuring and sampling the raw materials and products, and for conducting the test. Each product was subjected to a detailed examination, the results of which are given, and the report concludes with some general observations on the operation of the plant and of difficulties (mostly of a minor character) encountered during the test. The coal used was the undersize material from the dry cleaning plant at a Durham colliery. It was all below 3 in. in size, and contained 2 per cent. of moisture and 8 per cent. of ash. The coke recovered amounted to about 11½ cwt. per ton of coal charged. It was of small size, 45 per cent. passing through an 1/8 in. screen and 0.8 per cent. remaining on a 1/2 in. screen. The yield of gas was 4,095 cu. ft. per ton of coal, with a calorific value of 790 B.Th.U. per cu. ft. or 32.7 therms of gas per ton. The tar produced amounted to 18.2 gal. per ton of coal.

## Debt: Private and Public

A New Book by Sir Ernest Benn

AFTER a lengthy silence Sir Ernest Benn will make a return to public affairs on June 30 with a book on the timely subject of "Debt."\* The author possesses a double qualification to deal with this vital aspect of political affairs. His ability to make the "dry as dust science" interesting and even enjoyable for the ordinary reader has been shown in such successes as "The Confessions of a Capitalist," "Account Rendered," and "This Soft Age." But even more important is Sir Ernest Benn's ability to draw upon a lengthy, varied and successful experience in the practice of business and finance.

Debt strangely enough is a new subject for it was only during the war that public borrowing as now practised first commenced. The author draws a clear distinction between private and public debt, and makes what is probably the first attempt to explain the processes of borrowing and lending which enable the rest of the world to proceed. The inordinate growth of public indebtedness in recent years is widely recognised, but Sir Ernest Benn raises issues which are not so generally appreciated. The danger to the currency is undoubtedly the most serious of many risks of which he draws attention. More interesting, but also more debatable, is his contention that democracy is incompatible with a system of government controlled finance.

\* Debt: Private and Public, Good and Bad. By Ernest J. P. Benn, pp 168. London: Ernest Benn Ltd. 5s.

## Letter to the Editor

### The Late Mr. F. E. Hamer

SIR.—I was abroad when F. E. Hamer passed on and only now have the opportunity of paying tribute to his memory. My chief recollection of him is one lovely summer afternoon in my garden at Greenbank—it must have been on the occasion of the visit of the American Chemical Engineers—when, feeling at ease, he talked freely on a number of subjects concerning chemists, showing a depth of understanding and a vision which ever afterwards made him rank high in my estimation. Had he come in touch with our profession as a younger man, he might have proved the individual we have been seeking for a generation to unite us. As it was, he, through *THE CHEMICAL AGE*, played the leading part in making us more attracted to one another and in humanising our interests.

The young men to-day can hardly realise the change which has taken place over the last forty years in the social relations of chemists. Many can justly claim to have had a share in influencing it, but Hamer will rank high among them. At first impression he had no particular personality, but in his company things began to go more amiably, the quietest man was dragged into the conversation.

Chemistry is still the most difficult subject for the journalist; so long as the research worker neither knows nor cares about the wider implication of his work, he can hardly expect a layman writer to be able to make it intelligible. Hamer took the lead in brightening the technical chemical Press and it is largely thanks to his beginnings that we have so excellent a one to-day. We sorely need another Hamer to carry chemistry into the daily Press, who neglect the dozens, nay hundreds, of exciting true stories at their disposal, but give credence to any wild rumour which converts a lump of chalk into petrol.

Professor Soddy has recently advised scientific workers to create a mass belief in the superiority of scientific civilisation, as regards both material and spiritual satisfactions. I feel some such belief as this was the real key to Hamer's personality—in no other way could he have made so many friends among the more discerning of us. Perhaps he was one of those of whom Browning says,

"Thoughts hardly to be packed  
Into a narrow act;  
Fancies that broke through language and escap'd,  
All I could never be."

E. F. ARMSTRONG.

66 Barkstone Gardens,  
Earls Court, S.W.5.

## Hydrate in Natural Gas

### Measures to Avoid Troubles in Pipe-lines

PARTIAL dehydration of natural gas, or, if that process is not available, operation of the pipe-line system at least once every few days at line pressures low enough to favour decomposition of gas hydrates are remedial measures recommended by the United States Bureau of Mines in its latest progress report on a study of the hydrate problem in natural gas transmission lines. Hydrates, due to formation of solid material at temperatures above freezing point of water, cause stoppages in gas transmission lines and interfere seriously with the flow of gas.

This study, which is being conducted in co-operation with the Natural Gas Department of the American Gas Association, has progressed along four line of attack, namely, review of the literature, field study of the problem, laboratory investigation of the physical and chemical properties of gas hydrates, and study of methods suitable for preventing or relieving freeze-ups in natural-gas pipe-lines. Recently reviewed articles are cited in the report by W. M. Dutton and

E. M. Frost, Jr., chemists of the Petroleum and Natural Gas Division of the Bureau of Mines, which was presented before the American Gas Association at New Orleans, May 9-12.

Pressure and temperature surveys of pipe-lines are being made. The report points out, with reference to data obtained from actual pipe-line operation, that a pressure-temperature record used in connection with a hydrate melting-point curve for the gas, will indicate the proximity or presence of conditions favourable to hydrate formation. Without the pressure record, constriction in the line caused by hydrates may be passed unnoticed.

Both laboratory and field tests show that hydrates begin to break down almost immediately following a reduction of pressure to a value below the decomposition pressure. Accordingly, if pipe-line pressure does not go through a daily cycle, during which it drops below the hydrate decomposition pressure, the pipe-line might be operated advantageously in a manner that would permit weekly or bi-weekly reductions of line pressure to a value below hydrate decomposition pressure—thus freeing the line for greater and more efficient throughput. Most of the hydrate decomposition curves, as determined by experimental work in the laboratory, plot as straight lines on semi-log cross section paper; those for natural-gas hydrates are parallel. The slope of the lines, for which an empirical equation has been determined, is constant for all natural gases investigated.

As an adjunct in determining the effectiveness of various methods of gas dehydration and the efficiency and correct adjustment of dehydrating equipment, the Bureau of Mines has developed a new dew-point apparatus, which has been used by a number of operators, who have expressed their satisfaction in its performance. A detailed description of the apparatus for determining the dew point of gases under pressure has been prepared for a separate report of the investigations of the bureau. Future work under the programme includes the collection of data on the composition of the hydrates as they exist under pressure and in equilibrium with the gas from which they are formed. It is desirable from a practical operating view-point to find some correlation of the hydrate-forming characteristics with the properties of the gas from which the hydrates are formed.

## Glycerides from Fruit Stones

### Pure Coke By-Product

A METHOD for the complete conversion of the glycerides and proteins in grain and fruit stones to a mixture of hydrocarbons is reported by Legé (*Comp. rendus*, 1938, 206, 1264-1266). The material is first submitted to pyrolysis by passing it through a furnace whose highest temperature is 600° C., and in which the volatile products are removed from the hot zone immediately by forced circulation, and condensed in another part of the circuit. The residue in the furnace after complete evolution of the volatile products is pure coke.

The condensed distillate is heated with a contact catalyst consisting of a mixture of aluminates and silicates of alkaline earth metals. The function of these is to remove all the oxygen from the organic material as water, which is adsorbed on the catalyst. The distillate is oxygen free, and consists entirely of hydrocarbons. The contact mass can be dehydrated by heating to a high temperature, and is then ready for reuse. Using stones from tropical fruits, an average yield of 25 per cent. of pure coke was obtained, and 50 per cent. by weight of the primary distillate, which latter yield about 75 per cent. of liquid hydrocarbons.

SULPHUR ORE DEPOSITS located in the Bayac district, Department of Gard and Ardeche, France, contain a bituminous limestone which improves the adhesion when used as a vine spray. In spite of the low sulphur content, therefore, the material is an effective pesticide.

## Iodine in Agriculture

### A New Information Bureau Established

THE Nitrate Corporation of Chile, Ltd., announces the formation of an Iodine Educational Bureau to promote the knowledge and use of iodine in the agricultural, medical and industrial fields.

The new bureau will collect all available scientific information which has been developed in respect of iodine since 1811, when the element was discovered by the French chemist, Bernard Courtois. This information will be placed at the disposal of the medical profession and scientific agricultural circles, as well as commercial interests including feeding stuffs manufacturers and livestock breeders. In addition the bureau will collaborate with scientific institutions in experimental research to extend the knowledge of iodine, with special reference to its use in human and animal nutrition. It will not engage in any selling activities and its functions will be entirely educational. This activity is being organised in the interests of the Chilean iodine producers who supply more than three-quarters of the world's consumption.

The bureau will be under the direction of Dr. Francis C. Kelly, Ph.D., B.Sc., who has been associated with Sir John Orr for more than six years as deputy director of the Imperial Bureau of Animal Nutrition at the Rowett Research Institute in Aberdeen. He was probably the first investigator in Great Britain to study the rôle of iodine in nutrition.

Following two years in the Colonial Service as biochemist to the Medical Department of Kenya Colony, Dr. Kelly became technical adviser to the Chilean Iodine Producers' Association in 1928. In 1930 he was appointed a member of the Iodine Estimation Sub-committee of the Medical Research Council of Great Britain. When the Imperial Bureau of Animal Nutrition was established Dr. Kelly accepted his present appointment as deputy director in 1932. He will become director of the Iodine Educational Bureau in September, and his technical assistant will be Miss Ethelwyn M. Mason, M.Sc., of the New Zealand Department of Agriculture, who has been carrying out iodine research work at the Rowett Institute since 1934.

The offices of the Iodine Educational Bureau will be at Stone House, Bishopsgate, E.C.2.

## British Association Meeting

### What the Chemistry Section will Discuss

THE 1938 meeting of the British Association will be held at Cambridge, August 17-24, when the President of the Chemistry Section (Professor C. S. Gibson) in his opening address will review the recent advances that have been made, chiefly by himself and his co-workers, in the chemistry of gold.

Professor Gibson's address will be followed by a discussion on the recent advances in the organic chemistry of the metals with special reference to the noble metals, in which the principal speakers will be Dr. F. G. Mann, Professor L. C. Brockway (Pasadena) and Professor N. V. Sidgwick. Attention will be directed mainly to the electronic and stereochemical aspects of the subject. With the assistance of Dr. F. G. Mann, Mr. H. V. Thompson and Dr. F. H. Brain, the President will give a demonstration on the production and application of gold films by ancient and modern methods. The processes employed in the ceramic industry and methods depending on the decomposition of organic compounds of gold will also be demonstrated.

A discussion on modern methods of chemical analysis, including physical and microchemical methods, will be opened by Dr. J. J. Fox, Chief Government Chemist. Contributions will be made by Professor Dr. Walther Gerlach (Munich), Dr. Janet Matthews and others.

Professor W. L. Bragg will open a discussion on "Clays." He will be followed by Dr. R. K. Schofield, Dr. Nagelschmidt and Professor J. D. Bernal. The speakers will deal with the

atomic architecture of clay and clay-like minerals, with base exchange, the absorption and yielding up of water, and the behaviours of clays in soils.

The fourth symposium of the meeting, entitled "Repercussions of synthetic organic chemistry on biology and medicine," which has an added interest in view of the exceptional circumstance that the Physiological Section will not meet this year, is being arranged by Professor E. C. Dodds and Professor J. W. Cook. Recent work on the production of new compounds having the biological action of the sex hormones will be described by Professor Dodds and Professor L. Ruzicka (Zürich), and Dr. A. S. Parkes will deal with some of their interesting biological inter-relationships. The second half of the programme will be occupied with descriptions of synthetic compounds which are able to induce cancer (Professor J. W. Cook), of new compounds having the physiological action of the life-maintenance hormone of the adrenal cortex (Professor T. Reichstein, Zürich), and of the synthesis of vitamin B<sub>1</sub> and analogous compounds (Dr. A. R. Todd).

By the kind invitation of Professor Sir William Pope a visit will be made to the University Chemical Laboratories. Professor Sir F. Gowland Hopkins has also kindly invited the section to visit the departments of biochemistry, biology and the Molteno Institute. Visits will be made to the works of the Cambridge Instrument Co., and also to Stewarts and Lloyds' Steel Works at Corby.

The sectional dinner will be held in Sidney Sussex College, by kind permission of the Master and Fellows. The following chemists have accepted the Council's invitation to attend as foreign guests of the Association: Professor G. Bertrand (Paris); Professor L. O. Brockway (Pasadena); Professor Walther Gerlach (Munich); Professor T. Reichstein (Zürich), and Professor L. Ruzicka (Zürich).

## New Dew-Point Apparatus

### Increasing the Efficiency of Gas Transmission

EFFICIENCY of operation of natural gas pipe lines should be increased as the result of the development of a dew-point apparatus suitable for use with natural gases under pressure, by the United States Bureau of Mines. The temperature to which a gas may be cooled before water will begin to condense may be determined with this apparatus. This information is useful in the prevention of water condensation, which interferes with the flow of gas in the lines and, in combination with constituents of the gas, may form solid gas hydrates.

All natural gas, as it is produced from the well, carries some water in the form of vapour. The dew-point, or temperature at which this water vapour will start to condense, frequently is higher than the temperature of the pipe line it enters. When this condition exists, some of the water vapour will condense to liquid as the temperature of the gas drops to the temperature of the pipe line. The apparatus now announced by the Bureau of Mines is useful in determining the dew point of the gas at the well head or along the pipe line, thus making it possible to know whether there is any likelihood that water will condense from the gas.

The gas from a compressor station usually is saturated with water vapour at a temperature considerably above the temperature of the pipe line it enters; consequently unless the gas is dried a considerable amount of water is likely to condense in the line. Many pipe-line companies are installing equipment to remove a part of the water vapour in the gas to avoid condensation in their transmission lines. The dew-point apparatus is of value in determining the efficiency and correct adjustment of such equipment.

The new apparatus is suitable for working pressures up to 2,500 lb. per sq. in., but is equally satisfactory for use at lower pressures. Dew points may be determined with an accuracy of 0.2° F. It is described in Report of Investigations 3399, which may be obtained without cost from the Bureau of Mines, Washington, D.C.

## Liquefied Petroleum Gases

### A Survey of Sales Distribution in the United States

THE marketed production of liquefied petroleum gases in the United States totalled 141,505,000 gal. in 1937, according to a tabulation made from distributors' reports submitted to the Bureau of Mines. The 1937 volume of sales continued to show the sharp upward trend in the demand for liquefied petroleum gases in evidence in recent years and represents a gain of 33 per cent. over the 1936 total of 106,652,000 gal. Relative gains in all major uses of liquefied petroleum gases are indicated. The 1937 totals for both domestic or "bottled gas" use and internal-combustion-engine fuel increased about 36 per cent. over the 1936 requirements.

The quantity of liquefied gases sold in 1937 for industrial fuel and chemical manufacturing was about 28 per cent. above the 1936 record, while the total delivered for gas manufacturing purposes was 20 per cent. higher than the 1936 demand. Exports of liquefied petroleum gases to foreign countries in 1937 were reported as only 1,879,000 gal., compared with 4,897,000 gal. in 1936. Added exports and domestic demand gives total deliveries of 143,384,000 gal. in 1937, a gain of 29 per cent. over the 1936 total of 111,549,000 gal. Domestic sales of propane, butane, propane-butane mixture and pentane for the years 1932-1937 are shown in the following table. The figures given do not include liquefied petroleum gases used by producers or their affiliated companies as fuel or as raw material or re-acting agents in the manufacture of other products, but sales of petroleum gases to chemical manufacturing plants are included when the gases are delivered in a liquefied state.

TABLE I. — Sales of Liquefied Petroleum Gases, 1932-37, thou. gal.

Year	Propane	Butane	Propane-butane mixtures	Pentane	Total
1932	15,182	14,662	3,417	854	34,115
1933	15,835	19,056	3,226	814	38,931
1934	18,681	25,553	10,271	1,922	56,427
1935	26,814	34,084	13,492	2,465	76,855
1936	36,502	40,200	27,375	2,575	106,652
1937	46,474	45,504	46,694	2,833	141,505

#### Raw Material for Chemical Works

From about 1933 through 1936, sales of butane comprised the major portion of total deliveries; however, the 1937 totals show about equal amounts for propane and propane-butane mixtures. Propane sales in 1937 of 46,474,000 gal. represent a gain of 27 per cent. over the 1936 total of 36,502,000 gal. The market demand for butane in 1937 was reported as 45,504,000 gal. or 13 per cent. above the 1936 deliveries of 40,200,000 gal. The ratio of butane sales to total deliveries of all liquefied petroleum gases declined from 38 per cent. in 1936 to 32 per cent. in 1937, while propane-butane mixtures, which constituted about one-fourth of total deliveries in 1936, increased to one-third in 1937. Quantitatively, propane-butane sales totalled 46,694,000 gal. in 1937, a gain of 71 per cent. over the 1936 requirements. Pentane deliveries, which are relatively unimportant in volume, increased from 2,575,000 gal. in 1936 to 2,833,000 gal. in 1937.

About half of the marketed production of liquefied petroleum gases is used for industrial fuel and in the manufacture of chemicals. Liquefied gas reported under these classifications totalled 70,102,000 gal. in 1937, compared with 54,585,000 gal. in 1936. Most of this gain must be credited to the increased use of liquefied petroleum gases in the chemical manufacturing trade, which demand virtually doubled in 1937. The use of liquefied petroleum gases as raw material in the making of chemicals is expanding at a rapid rate as their chemical structure is better understood and new processes for their conversion into desirable products are developed step by step from the experimental to the com-

mercial stage. Liquefied petroleum gases sold to chemical plants are usually cracked or broken down chemically and then are further treated to produce ethylene glycol, alcohols, acetone and other derivatives. Still another process is based on the chlorination of pentane to produce amyl chlorides, which are then converted into other products. The sale of liquefied petroleum gases to chemical plants, which in the past year or two has reached an important volume, bids fair to continue to expand.

#### "Bottled Gas"

The quantity of liquefied petroleum gases sold for industrial fuel increased about 8 per cent. in 1937 over the 1936 requirements. This relatively moderate gain in 1937 is evidently due to some extent to the slowing up of industrial activities in the second half of the year. Extensive advertising of the merits of "bottled gas," improved equipment for its storage, handling and use and better service covering larger areas, were largely responsible for the expansion in the domestic demand for liquefied petroleum gases in 1937 to 40,823,000 gal., a gain of 36 per cent. over the 1936 total. Liquefied petroleum gases used by gas companies for direct distribution through their mains and for the enrichment of other gases before delivery to consumers increased from 9,371,000 gal. in 1936 to 11,280,000 gal. in 1937, or 20 per cent. Liquefied petroleum gases sold for internal-combustion-engine fuel is becoming of important volume, sales for this purpose increasing from 12,476,000 gal. in 1936 to 16,987,000 gal. in 1937. This use of petroleum gases as motor fuel is confined largely to the California area, where sales of 15,000,000 gal. were reported for 1937.

Sales of propane for all purposes were reported as 46,474,000 gal. in 1937, compared with 36,502,000 gal. in 1936. Approximately two-thirds of the 1937 quantity, or 30,436,000 gal., were sold for domestic use, while about 14,500,000 gal. were delivered to industrial plants for fuel. Gas manufacturing companies purchased 1,077,000 gal. of propane in 1937, compared with 944,000 gal. in 1936. Minor quantities of propane were sold as raw material to chemical manufacturers, for internal-combustion-engine fuel and other miscellaneous uses. Butane, because of its higher heat content per gallon, is used principally as an industrial fuel, the quantities sold for this purpose being about 28,000,000 gal. for both 1936 and 1937. Butane gas reported for household use was 6,047,000 gal. in 1937, compared with 2,956,000 gal. in 1936. The butane delivered for domestic consumption increased over 100 per cent. in 1937 compared with the 1936 total, thereby repeating a similar gain made in 1936 over 1935.

#### Propane-Butane Mixtures

One development which has been important in accounting for the large relative increases in the use of butane as a domestic fuel is the active sales campaign in the south central portions of the country, where a ready supply is available from petroleum refineries and gasoline plants. Simple equipment using an outdoor tank can be installed, consequently consumers using butane can have all the advantages of natural gas at a lower cost than is possible in other sections of the country. Gas manufacturers also increased their purchases of butane substantially in 1937 receiving 7,430,000 gal., a gain of more than 19 per cent. above their 1936 requirements. Butane sales for internal-combustion-engine fuel in 1937 totalled 1,715,000 gal., or somewhat under the revised total of 2,367,000 gal. for 1936. Propane-butane mixtures are used extensively as raw material in the manufacture of chemicals and this demand accounted for over half of the 1937 deliveries. They are also used to a large extent for internal combustion-engine fuel.

## Permanganate in India

### A New Process Avoiding Imports of Raw Material

**D**R. S. S. JOSHI, head of the chemistry department at Benares Hindu University, and Mr. L. S. Chandrakant, a research scholar in the same department, claim to have succeeded in producing permanganate of potash by employing materials indigenous to India.

The principal method now in use for the manufacture of potassium permanganate requires manganese dioxide, caustic potash and potassium chlorate. Of these materials, the last two have to be imported almost entirely. As a theoretical proposition, however, potassium nitrate can be employed, but in actual practice appreciable difficulties arise. It is, nevertheless, an interesting fact that abundant supplies of potassium nitrate occur in India in the Punjab, Bengal and some parts of Bihar.

Methods now being developed at Benares University utilise manganese dioxide, potassium nitrate mainly and certain catalysts in small amounts. It has been found that the electrolysis of an appropriate mixture of these substances in the fused state under certain conditions gives the permanganate direct, in satisfactory yields. This method therefore eliminates completely the use of material which has to be imported into India to the value of over Rs. 400,000 annually. The possibility of producing ammonia from Indian potassium nitrate by an electro-chemical method is also under investigation.

## High Molecular Weight Esters

### Colouring Power for Lacquers

THE production by I. G. Farbenindustrie of a range of high molecular weight esters, soluble in oils, fats and waxes, and having high colouring power, showing at the same time a very intense fluorescence, is described in *Paint Technology*, 1938, 3, 26, 61-62.

The compounds described are of the general type  $(R.COOC)_nX$ , where R is a straight or branched-chain alkyl radicle, or a hydroaromatic one, while X is a radicle containing at least four condensed isocyclic nuclei, with or without heterocyclic nuclei. They are made by reacting compounds containing X and at least one OH group with acid chlorides or other esterifying compounds containing R. Thus a compound giving a yellow-red solution in paraffin oil, with an olive-green fluorescence, is obtained by the reaction of 10 parts of stearic acid chloride with 5 parts of dibenzanthrone, in 7 parts of sodium hydroxide solution (35 per cent.), 5 parts of hydrosulphite and 50 parts of water at 40° C. The ester is filtered off and purified by boiling with alcohol. In place of the stearyl acid chloride, those derived from lauric, oleic, naphthenic or palm kernel oil acids may be used.

These compounds are miscible with hydrocarbon oils, natural fats and waxes, natural and synthetic resins, nitro-cellulose and rubber, and should find considerable application in the colouring of lacquers.

## Sterilisation of Fruit Juices

### Oligodynamic Method Better than Pasteurisation

**T**HE application of the "oligodynamic" method of sterilisation for the treatment of fruit juices on the commercial scale, is described in *Canadian Chemistry and Process Industries*, 1932, 22, 129, 131.

The oligodynamic method originated in the observation about 40 years ago, by Van Nageli, that water which had stood in contact with metals such as copper, silver, or mercury, acquired disinfecting properties. Later work has shown that the phenomenon is due to superficial oxidation of the metal and solution of the oxide layer, the metal ions thus

entering the water being very potent in the destruction of bacteria.

In the commercial application of this principle, known in Canada as the Matzka process, the liquid to be sterilised is forced through the annular space between an outer stainless steel tube and an inner silver one. The temperature of the liquid is maintained at about 120-150° F. by passing hot water (counter-current to the liquid) through the silver pipe and also through a tube which jackets the stainless steel pipe. Although the liquor after treatment contains not more than one part of silver per 100 millions, it is completely sterilised and will not ferment unless infected subsequently.

The process has several advantages over pasteurisation. It is carried out at temperature 15-20° F. below that at which pasteurisation is normally effected, and as a consequence the loss of flavour and destruction of the vitamin content which normally accompanies this process, are completely avoided. Also the treatment can be applied to turbid liquors containing pulp, such as tomato and orange juices. These should first be de-aerated to avoid damage by oxidation when hot.

## Technical Science Training

### University Scholarships at Manchester

**T**HE Manchester Education Committee offers a limited number of scholarships and exhibitions tenable in any one of the three years' full-time day courses leading to the degree of B.Sc. Tech. at the Municipal College of Technology, Manchester University.

Scholarships will be awarded conditionally upon candidates qualifying to enter a higher course in the Faculty of Technology, in accordance with the ordinances prescribed in the current prospectus of the College of Technology, Manchester. The scholarships will be open to part-time day or evening students in the college and others whose parents are ratepayers of the city. In the event of there not being sufficient Manchester students qualified to enter upon a higher course, and only in that case, the committee may offer the scholarships to suitably qualified students who have no ratepayer qualification.

Exhibitions will be awarded conditionally upon candidates becoming qualified for admission to a degree course in the Faculty of Technology. The conditions of admission were revised last December, and intending candidates are advised to apply to the Joint Matriculation Board, 315 Oxford Road, Manchester, for further information. Candidates must be ratepayers, or children or wards of ratepayers, of the city.

Forms of application and all information may be obtained by written application to the Registrar, College of Technology, Manchester, 1.

## Ten Years Back

### From "The Chemical Age," June 9, 1928

Bios No. 1, a product occurring in the muscular substance of the heart, in the lungs, kidneys, brain, etc., and in plants, is said to have been isolated by Professor W. Lash-Miller and his collaborators at the University of Toronto. The chemical nature of the substance is unknown, but it is necessary for the growth of yeast, and its isolation may be of very great biochemical importance.

\* \* \* \*

Industrial Processes Development, Ltd., has just arranged the financing and incorporation of a new company, Mulsoid Products Corporation, with head office and plant at Ogdensburg, New York State, to manufacture and supply various brands of "Mulsoid" to the textile, laundry and dry-cleaning industries in the United States. "Mulsoid" is a scientifically designed scouring and cleansing agent, originally developed in Great Britain. It is claimed to have unusual properties for dissolving grease and removing dirt.

## Personal Notes

MR. ARTHUR HASWELL, works manager and analytical chemist, of Liverpool, has been nominated for the by-election in Old Swan Ward, Liverpool.

MR. E. R. ANDREWS, F.I.C., is to succeed MR. E. T. SHELBOURN, F.I.C., as chemist-in-chief to the London County Council. Mr. Shelbourn retires as from June 9.

PROFESSOR G. G. HENDERSON, emeritus professor of chemistry in the University of Glasgow, will receive the honorary degree of LL.D. at the University Commemoration meeting on June 22.

MR. THOMAS M. LAPPIN, chemist and technical assistant in the lighting department of Glasgow Corporation, has been appointed public lighting engineer under Dundee Corporation, by a majority of one vote.

LORD BEARSTED, who is chairman of Venezuelan Oil Concessions and the Asiatic Petroleum Co., Ltd., and also chairman and managing director of the Shell Transport and Trading Co., Ltd., has given £18,000 towards the cost of enlarging the Ashmolean Museum at Oxford.

MR. ALEXANDER M'DONALD, B.Sc., gas manager of Motherwell and Wishaw, has been appointed general manager of a group of seven undertakings under the United Kingdom Gas Corporation at Castleford, Yorkshire. The corporation controls about 50 gas undertakings. Mr. M'Donald was a demonstrator in chemistry and metallurgy at Dalziel Technical School.

LORD AND LADY LEVERHULME are accompanying the large party of British chemists who sailed for Canada on Friday, in the Canadian Pacific liner "Duchess of Atholl," to attend the annual meeting of the Society of Chemical Industry, which takes place in Ottawa on June 20. After a visit to Sudbury, Toronto, and Niagara Falls, the party will return home in the liner "Duchess of York," which leaves Montreal on July 1 for Liverpool.

MR. WEIR, director and member of the management board of Imperial Chemical Industries, Ltd., and a director of the International Nickel Company of Canada, has been created a viscount in the Birthday Honours List. SIR JOSIAH STAMP, who was a director of Imperial Chemical Industries, Ltd., 1927-28, has been created a baron. New knights bachelor include MR. ANDREW AGNEW, a director of the Anglo-Saxon Petroleum Co., Asiatic Petroleum Co., Canadian Eagle Oil Co., United British Oilfields of Trinidad, Venezuelan Oil Concessions, and other oil companies; MR. ARTHUR EDWIN CUTFORTH, a member of Oil from Coal Sub-Committee of the Committee of Imperial Defence, 1937; and MR. LOUIS WILLIAM SMITH, M.P., a director of Fison, Packard and Prentice, Ltd.

MR. JACK GREENWOOD, of the production development department, Boots Pure Drug Co., Ltd., Nottingham, is one of nine candidates who have been chosen for the award of grants to enable them to attend the seventh International Congress for Industrial Management, to be held at Washington, in September. These grants, of the value of £60 each, were offered to young people likely to hold future executive posts in industry, in accordance with a scheme for utilising the balance of funds from the sixth Congress which was held in London in 1935. Among the other selected candidates are:—Mr. John Manger, assistant sales manager, J. Manger and Son, Ltd., suppliers of salt, soad, soap, and edible oils, London; Mr. Frederick Morton, dye works manager, A. E. Hawley and Co., Ltd., Hinckley; Mr. H. H. Longman, Unilever Central Supplies Department, London; Mr. Geoffrey Bairstow, technical assistant, Dunlop Rubber Co., Ltd., Birmingham; and Mr. Robert Walker, departmental sales manager, Walker Crosweller and Co., Ltd., scientific instrument makers, Cheltenham.

### OBITUARY

MR. H. N. RICHARDSON, chairman of directors of John Richardson and Co. (Leicester), Ltd., manufacturing chemists, has died at the age of 73.

MR. FRANCIS EDWARD POWELL, chairman of the Anglo-American Oil Co., for twenty years, has died from heart attack at Washington. Mr. Powell was born in Cincinnati, Ohio, and came to Europe in 1901 to represent the interests of the Standard Oil Co. He became a director of the Anglo-American Oil Co. in 1904 and chairman in 1911, retiring from the chairmanship in 1931. Since 1928 he has been president of the American Chamber of Commerce in London. He was also a former chairman of the International Sugar Council.

## Foreign Chemical Notes

### Italy

ONLY HOME-PRODUCED SYNTHETIC TEXTILES will be used in future for the motor tyres of the Pirelli S.A.

### Jugoslavia

THE NEW ELECTROLYTIC COPPER PLANT of the Soc. Francaise des Mines de Bor is going into production this month.

### Japan

THE MERCURY OUTPUT of the Toyo Suigin K.K. is to be raised from 2 tons to 4 tons per month.

### Germany

PLANT FOR THE MANUFACTURE OF SYNTHETIC PHENOL is to be erected by the Rütgerswerke A.G., of Berlin.

### France

SYNTHETIC ZEOLITE IS NOW BEING MADE from sodium aluminate by a factory in Marseilles.

EXPERIMENTS HAVE BEEN COMMENCED with a view to recovering vanadium, titanium and zirconium from the red sludge obtained by a by-product in working up bauxite.

### Turkey

KUTAHYA HAS BEEN CHOSEN AS CENTRE for the establishment of a chemical industry within the Five Year Plan, in view of the extensive lignite deposits (estimated at 400 million tons) in the vicinity. With lignite as the raw material it is proposed to manufacture synthetic petrol. The first factories to be equipped will be those for the production of chlorine, caustic soda, hydrochloric acid, sulphuric acid, superphosphate and nitrogenous fertilisers.

KELLY'S DIRECTORY OF MERCHANTS, MANUFACTURERS AND SHIPPERS OF THE WORLD, 1938. 2 vols. London: Kelly's Directories, Ltd., 64s.

This book, as in the past, consists of two volumes—which together form a complete buyers' and sellers' guide for home and foreign trade. To take home trade first, the larger part of Vol. II deals with the British Isles and this section is in fact, a general trade directory of the British Isles, covering the wholesale and manufacturing trades, classified both alphabetically and by trades. As such it is invaluable to firms interested in home trade only. The rest of Vol. II is devoted to the British Empire other than the British Isles, and here the names of agents, exporters, importers, wholesale merchants and manufacturers are arranged alphabetically by trades and towns under the various geographical divisions. Vol. II thus covers the wholesale trade of the British Empire. In Vol. I will be found particulars for all the countries of the world, other than the British Empire, and the information in it is arranged similarly to that in the Dominion and Colonial section of Vol. II. Here the British exporter will find what he needs to know with regard to world markets and the firms overseas with whom he wishes to get into touch.

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## From Week to Week

CONSIDERABLE DAMAGE BY FIRE WAS DONE to one of the rooms in the laboratory of the Steel Company of Scotland, Ltd., at Hallside Steelworks, Cambuslang, on June 1.

TO COMMEMORATE THE FOUNDING OF THE FIRM 90 years ago, nearly 120 members of the staff of Parkinsons, Ltd., manufacturing chemists, Curzon Street, Burnley, were recently entertained to dinner by the directors.

CHROMATES, LTD., chemical engineers, etc., of East Croydon, Surrey, have increased their nominal capital by the addition of £9,900 beyond the registered capital of £100. The additional capital is divided into 198,000 unclassified shares of 1s. each.

THE TOMASZOW ARTIFICIAL SILK WORKS, Poland, proposes to increase the share capital from 24 million zloty to 30 million zloty by capitalising six million zloty of the special reserve. The nominal value of each share will thereby be increased from 120 to 150 zloty.

THE VASTNESS OF THE OPERATIONS of the I. G. Farbenindustrie (German Dye Trust) is revealed in the report for 1937. Business receipts in the past year amounted to over £44,000,000, and the net profit was £3,560,000. Stocks at the end of the year were valued at £15,000,000.

THE NORWEGIAN GOVERNMENT HAS ACCEPTED the British Government's invitation to attend the International Whaling Conference which will open in London on June 13. The four Norwegian delegates are Professor B. Bergersen, chairman, Mr. S. Johannessen, under-secretary of the Board of Trade, Mr. T. V. Aass, chief clerk of the Foreign Office, and Mr. V. Voss, barrister.

HARRY WILLIAMS (32), of Park View, Terfyn Cottages, Bodelwyddan, near Abergel, died on June 3, from injuries which he received while carrying out chemical experiments in a small toolshed at the rear of his residence. Williams is believed to have been attempting to make petrol gas with oxygen and petrol vapour and to induce the gas into an empty cylinder with the aid of a bicycle pump.

ALL ADULT WORKERS IN THE PAINT, COLOUR AND VARNISH INDUSTRY are to receive an increase of 1s. a week, with a proportionate increase to pieceworkers, youths and girls. The existing minimum rate for adults is 54s. This decision of the Industrial Court, which heard representatives of the employees' and employers' sides of the National Joint Industrial Council for the industry, was announced last night. About 15,000 workers are concerned.

THE BRITISH ROAD FEDERATION is asking if petrol taxation is to remain as high as 8d. per gallon until 1950? In a statement issued this week, the Federation points out that this is the implication from Clause 2 of the Finance Bill, now before the House of Commons. This clause lays down that the preference on home-produced fuel shall be at least 8d. for the next twelve years, and this appears to mean that there will be no reduction on the ordinary fuel tax to below 8d. for that period. The present taxation derived from motor fuel is £51,000,000 per annum.

A LEGAL GUIDE FOR COMMERCIAL MOTOR DRIVERS has been published by The Commercial Motors Users' Association. Copies may be obtained from the Association, 50 Pall Mall, London, S.W.1, at a price of 4d. each, post free. The main provisions of the Road Transport Lighting Act, 1927; the Road Traffic Acts, 1930-1934; the Road and Rail Traffic Act, 1933; the Road Vehicles Lighting Regulations, 1936; the Motor Vehicles (Construction and Use) Regulations, 1937-1938; and the Removal of Vehicles Regulations, 1938, have been included in the guide, in so far as they affect drivers.

THE SWANSEA TECHNICAL COLLEGE METALLURGICAL SOCIETY held its 19th annual meeting on June 2, when Mr. Idris Williams presided. The membership has now reached 346. Tributes were paid to the retiring president, who congratulated Mr. J. S. Walton on his succession to the presidential chair for the coming year. The following officers were elected: Vice-presidents, O. J. Thomas and H. I. Bell; hon. treasurer, Urias Williams; hon. secretaries, C. Hopkins and J. C. Godsell; committee, H. N. Bowen, T. J. Canning, C. H. Cuniff, E. A. Davies, G. T. Jones, G. Rees, W. J. Shipton and O. Thomas.

THE 1938 ISSUE of the "Oil and Petroleum Year Book," gives complete particulars concerning 774 companies engaged in producing, carrying and marketing oil, financing oil development, or directly associated in any way with the oil industry in all parts of the world. During the past two years particulars of over 200 companies not previously given have been added. Other useful features are the statistical tables showing the world's production of crude petroleum for the nine years ended December, 1937, a list of 724 trade names of petroleum products marketed by the various companies and a glossary of 136 technical terms and words peculiar to the oil industry. The book is published by Walter E. Skinner, 15 Dowgate Hill, Cannon Street, E.C.4, price 10s.

L. STERNE AND CO., LTD., of Crown Ironworks, Glasgow, have received a contract for the supply of the air dehydration plants for the Royal Ordnance Factory at Chorley, Lancashire.

VENO DRUG CO., LTD., have increased their nominal capital by the addition of £130,000 beyond the registered capital of £640,000. The additional capital is divided into 2,600,000 deferred ordinary shares of 1s.

THE ANNUAL INSPECTION of the field plots and laboratories of the Rothamsted Experimental Station, will be held on June 29, beginning at 11.15 a.m. Further information can be obtained from the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

BABCOCK AND WILCOX, LTD., have acquired from the Allen-Sherman-Hoff Co., of Philadelphia, the exclusive world rights, except for the United States and Canada, for the manufacture and sale of the hydro-jet system of ash and dust handling, hitherto held by the Ash Co. (London), Ltd.

THE HIGH COURT HAS DIRECTED A MEETING to be convened for June 23, of the preference shareholders (other than Fison, Packard and Prentice, Ltd.), of the Anglo-Continental Guano Works, Ltd., for the purpose of considering a scheme of arrangement proposed between the company and the preference shareholders.

WORLD PRODUCTION OF RAYON YARN and staple fibre during 1937 reached the record high level of 1,809 million lb., compared with 1,319 million lb. in 1936. The world output of filament yarn totalled 1,186 million lb., compared with 1,021 million lb. in 1936, with all countries showing a fairly uniform increase. The world production of staple fibre amounted to 623 million lb. against 298 million lb. in 1936.

TO MARK THE OCCASION OF THE OPENING of their new factory for the manufacture of natural fruit juice products, W. J. Bush and Co., Ltd., of Ash Grove, Hackney, London, held a luncheon at the Savoy Hotel on May 30, Mr. J. M. Bush presiding. The guests were subsequently taken to Hackney to see the process of fruit juice production, in which great care is taken to preserve the natural vitamin content of the fruit and to avoid any alteration in respect of natural sugars and mineral constituents. The equipment in the main factory hall is movable, and all containers used in extraction and storage operations are made of stainless steel.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

### Bankruptcy Information

CARMAC LABORATORIES, LTD., 163 High Street, Hampton Hill, Middlesex. First meeting, June 16, 1938; 11.30 a.m.; 33 Carey Street, Lincoln's Inn, London, W.C.2. Contributors, June 16, 1938; 12 noon; 33 Carey Street, Lincoln's Inn, London, W.C.2.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

LONABARC COLOUR WORKS, LTD., London, S.E. (M., 11/6/38.) May 28, series of £2,000 debentures, present issue £1,500; general charge.

### Satisfaction

AYRTON SAUNDERS AND CO., LTD., Liverpool, manufacturing chemists. (M.S., 11/6/38.) Satisfactions May 25, of mortgage registered April 3, 1920, to extent of £750, and of mortgage registered January 12, 1923, to extent of £5,000.

### Companies Winding-up Voluntarily

HUGHES STUART CARBON PRODUCTS, LTD. (C.W.U.V., 11/6/38.) May 26. H. J. Stephens, 69 Old Broad Street, E.C., liquidator.

## Books Received

British Chemical Industry. By Sir Gilbert T. Morgan and David Doig Pratt. London: Edward Arnold and Co. Pp. 387. 21s.

## Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Applications for Patents

MEANS FOR ALLAYING CORROSION.—W. V. Gilbert. 14278.

MANUFACTURE OF CARBURETTED WATER GAS.—A. R. Griggs. 14841.

AVOIDING DEPOSITIONS OF CARBONATES FROM WATER.—F. Hahn (Germany, Jan. 4.) 14195; (Germany, March 12.) 14196.

MANUFACTURE OF ETHERS of 2-methyl-2-hydroxy-3-chloro-tetrahydrofuran.—F. Hoffman-La Roche and Co., A.-G. (Switzerland, July 20, '37.) 14292.

MANUFACTURE OF CELLULOSE DERIVATIVES, ETC.—A. A. Houghton and Imperial Chemical Industries, Ltd. 14401.

MANUFACTURE of SULPHONATING PRODUCTS of aromatic sulphonic acid halides.—I. G. Farbenindustrie. (Germany, May 13, '37.) 14340.

REMOVAL of MAGNESIUM from MECHANICAL MIXTURES of metallic beryllium, etc.—I. G. Farbenindustrie. (Germany, July 1, '37.) 14342.

MANUFACTURE, ETC., OF WATER-SOLUBLE BASIC ALUMINIUM COMPOUNDS.—I. G. Farbenindustrie. (Germany, May 15, '37.) 14387.

MANUFACTURE of VINYL HALIDES.—I. G. Farbenindustrie. (Germany, May 28, '37.) 14588.

MANUFACTURE of AZODYESTUFFS.—I. G. Farbenindustrie. (Germany, May 18, '37.) 14658.

PRODUCTION of WATER-RESISTANT COMPOSITIONS.—International Patents Development Co. (United States, July 9, '37.) 14222.

MANUFACTURE, ETC., OF COMPOUNDS SIMILAR to POLYAMIDES.—G. W. Johnson (I. G. Farbenindustrie.) 14204, 14384.

MANUFACTURE, ETC., OF COMPOUNDS CONTAINING OXYGEN.—G. W. Johnson (I. G. Farbenindustrie.) 14385.

MANUFACTURE of ALDEHYDES AND KETONES.—G. W. Johnson (I. G. Farbenindustrie.) 14558.

MANUFACTURE, ETC., OF HALOGEN-HYDROCARBONS.—G. W. Johnson (I. G. Farbenindustrie.) 14560.

MANUFACTURE, ETC., OF GLYCOLS.—G. W. Johnson (I. G. Farbenindustrie.) 14561.

MANUFACTURE, ETC., OF OLEFINE OXIDES.—G. W. Johnson (I. G. Farbenindustrie.) 14562.

MANUFACTURE, ETC., OF RESINS.—G. W. Johnson (I. G. Farbenindustrie.) 14563.

MANUFACTURE, ETC., OF DYESTUFFS of the phthalocyanine series.—G. W. Johnson (I. G. Farbenindustrie.) 14732.

PREPARATION of NEW THERAPEUTICALLY USEFUL HETEROCYCLIC COMPOUNDS.—May and Baker, Ltd., A. J. Ewins, and M. A. Phillips. 14197.

PREPARATION of PHOSPHOROUS NITRIDE.—H. B. V. Moureu, and G. Wetroff. (France, May 15, '37.) 14454.

SYNTHETIC PRODUCTION of HYDROCARBON OILS.—W. W. Myddleton. 14180.

PREPARATION of CALCIUM, ETC., SALTS of acid sulphuric acid esters with more than six carbon atoms in the molecule.—Naamloose Vennootschap de Bataafsche Petroleum Maatschappij (Holland, May 31, '37.) 14393.

RECOVERY of ALYKL PHENOLS from petroleum oils.—Naamloose Vennootschap de Bataafsche Petroleum Maatschappij. (United States, May 25, '37.) 14596; (United States, Nov. 22, '37.) 14597.

MANUFACTURE of HETEROCYCLIC COMPOUNDS.—W. A. Sexton, and Imperial Chemical Industries, Ltd. 14590.

PROCESS of OBTAINING FUEL OIL from digested sludge.—S. Shibata. 14591.

PRODUCTION of WATER-SOLUBLE CELLULOSE ETHERS in powder form.—F. Sichel, A.-G. (Germany, May 15, '37.) 14392.

METHOD of OPERATING a POLYMERISATION PLANT.—Sinclair Refining Co. (United States, June 23, '37.) 14726.

MANUFACTURE of GASOLINE and fuel oil.—Sinclair Refining Co. (United States, June 15, '37.) 14727.

MANUFACTURE of SUBSTITUTED PERINAPHTHINDANDIONES.—Soc. of Chemical Industry in Basle. (Switzerland, May 18, '37.) 14691.

MANUFACTURE of DYESTUFFS containing metal.—Soc. of Chemical Industry in Basle. (Switzerland, May 19, '37.) 14692.

MANUFACTURE of NUCLEAR-ALKYLATED 6:6'-DIAMINO-STILBEN-2:2'-DISULPHONIC ACIDS.—Soc. of Chemical Industry in Basle. (Switzerland, May 19, '37.) 14693.

PURIFICATION of AQUEOUS ALKALI METAL HYDROXIDES.—A. H. Stevens (Pittsburgh Plate Glass Co.). 14680.

CONCENTRATION of AQUEOUS ALKALI METAL HYDROXIDES.—A. H. Stevens (Pittsburgh Plate Glass Co.). 14681.

TREATMENT of LAC, ETC.—A. F. Suter, A. Janser, and W. E. Suter. 14531.

HARD-METAL ALLOYS and tools, etc., made therefrom.—Tool Metal Manufacturing Co., Ltd. (Germany, May 15, '37.) 14230.

CATALYST for OXIDATION of OLEFINES.—United States Industrial Alcohol Co. (United States, May 15, '37.) 14551.

PROCESS for EXPELLING, ETC., CARBON DISULPHIDE, ETC., FROM LIQUIDS.—Vereinigte Glanzstoff-Fabriken, A.-G. (Germany, May 18, '37.) 14864.

HEAT-RESISTANT CHROME STEEL ALLOY, ETC.—S. Westberg. (Norway, May 13, '37.) 14175.

PRODUCTION of LOW-CARBON STEELS.—S. Westberg. (Norway, May 18, '37.) 14532.

PRODUCTION of IRON, ETC., from finely divided, etc., material.—S. Westberg. (Norway, May 18, '37.) 14533; (Norway, July 27, '37.) 14534.

ELECTROLYTIC PURIFICATION of ALUMINIUM.—Aluminium Industrie, A.-G. (Switzerland, June 3, '37.) 15370.

ANTHRAQUINONE COMPOUNDS.—A. W. Baldwin, N. H. Hadcock, E. C. S. Jones, F. Lodge, H. A. Piggott, and Imperial Chemical Industries, Ltd. 15010.

MANUFACTURE, ETC., OF MINERAL OIL.—B. Buxbaum. 15520.

PRODUCTION of DYEINGS fast to light.—A. Carpmael (I. G. Farbenindustrie.) 14983.

PROCESS for REMOVING NAPHTHENIC ACIDS from mineral oils, etc.—H. D. Elkington (Naamloose Vennootschap de Bataafsche Petroleum Maatschappij.) 15352.

PROCESS for RENDERING TEXTILES WATER-REPELLENT.—M. Flores, and W. Essers. (Germany, Aug. 23, '37.) 15478.

MANUFACTURE of DYESTUFFS.—B. Gaspar. 14940.

MANUFACTURE of WATER-SOLUBLE CONDENSATION PRODUCTS.—J. R. Geigy, A.-G. (Switzerland, May 24, '37.) 15240.

MANUFACTURE of STRATIFIED BODIES from synthetic resins.—T. Goldschmidt, A.-G. (Germany, June 29, '37.) 15205.

ALKALINE DETERGENT PRODUCTS.—Griffith Laboratories, Inc. (United States, June 14, '37.) 15317.

MANUFACTURE of MONOAZO-DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 15112.

MANUFACTURE of CONDENSATION, ETC., PRODUCTS.—W. W. Groves (I. G. Farbenindustrie.) 15304, 15305.

MANUFACTURE of PLASTIC MASSES containing softening agents.—W. W. Groves (I. G. Farbenindustrie.) 15463.

PRODUCTION of UREA-FORMALDEHYDE MOULDING MIXTURES.—J. E. H. Hayward and Bakelite, Ltd. 15214.

METHODS of PRODUCING DOUBLE FLUORIDES of alkali metals and aluminium.—H. W. Heiser. (United States, May 24, '37.) 15467.

EXTRACTION of FLUORINE VALUES from fluorspar ores.—H. W. Heiser. (United States, May 24, '37.) 15468.

MANUFACTURE of ANEURIN.—F. Hoffman-La Roche and Co., A.-G. (Switzerland, July 22, '37.) 14957.

MANUFACTURE of STYRENES.—R. G. Humphreys, B. T. D. Sully, and A. Boake, Roberts and Co., Ltd. 15143.

MANUFACTURE of DERIVATIVES of SULPHURATED PROTEINS, ETC.—O. Huppert. (Czechoslovakia, April 29.) 15287.

MANUFACTURE of MIXED RESINS for cation exchange.—I. G. Farbenindustrie. (Germany, May 22, '37.) 15306; (Germany, Feb. 8.) 15307.

MANUFACTURE of ARTIFICIAL RESINS.—I. G. Farbenindustrie. (Germany, May 24, '37.) 15464.

PROCESS for the DESTRUCTIVE HYDROGENATION of SOLID CARBONACEOUS MATERIALS.—International Hydrogenation Patents Co., Ltd. 15399.

THERMAL TREATMENT of CARBONACEOUS SUBSTANCES.—G. W. Johnson (I. G. Farbenindustrie.) 14981.

SEPARATION of NICKEL and COPPER.—G. W. Johnson (I. G. Farbenindustrie.) 15108.

MANUFACTURE, ETC., of COMPOUNDS of the anthraquinone series.—G. W. Johnson (I. G. Farbenindustrie.) (Nov. 15, '37.) 15345.

MANUFACTURE, ETC., of PLASTIC MASSES.—G. W. Johnson (I. G. Farbenindustrie.) 15614.

PRODUCTION of METAL PHOSPHATES.—F. P. Kerschbaum. (United States, May 21, '37.) 15172.

MANUFACTURE of ARTICLES RESISTANT to INTRA-CRYSTALLINE CORROSION.—F. Krupp, A.-G. (Germany, June 16, '37.) 15369.

HERMETIC CLOSURES for CORROSIVE LIQUIDS.—Mallinckrodt Chemical Works. (United States, June 4, '37.) 15501.

MANUFACTURE of STEEL.—F. P. Mehta. (British India, June 28, '37.) 15293.

MANUFACTURE of STEEL.—F. P. Mehta. (British India, June 4, '37.) 15294.

MANUFACTURE of LIQUID BASIC DEPHOSPHORISING SLAG.—F. P. Mehta. (British India, June 4, '37.) 15295.

APPARATUS for PERFORMING CHEMICAL REACTIONS.—Metallges, A.-G. (Germany, June 16, '37.) 15167.

TREATMENT of CELLULOSES, ETC.—G. Meunier. (France, May 24, '37.) 15512.

TREATMENT of ZINC DUST.—Siemens and Halske, A.-G. (Germany, May 27, '37.) 15642.

MANUFACTURE of AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, May 22, '37.) 15308, 15309, 15310, 15312; (Switzerland, April 27.) 15311; (Switzerland, May 5.) 15313.

MANUFACTURE of MERCAPTO-ARYL-THIAZOLES.—United States Rubber Products, Inc. (United States, May 27, '37.) 15073.

RECOVERY of OLEFINE OXIDES from gaseous mixtures, etc.—U.S. Industrial Alcohol Co. (United States, July 29, '37.) 15610.

PURIFICATION OF ORGANIC SUBSTANCES.—A. W. C. Taylor, J. W. Woolcock, A. G. Hellcar, and Imperial Chemical Industries, Ltd. 15378.

DEHYDRATION BY AZEOTROPIC DISTILLATION.—Usines de Melle. (France, May 25, '37.) 15203.

DEPOSITION OF ZINC AND ALUMINIUM ALLOYS.—H. Webb. 15201.

PRODUCTION OF HIGH-GRADE CELLULOSE.—Wiggins, Teape and Co. (1919), Ltd., and S. R. H. Edge. 15080.

### Specifications Accepted with Dates of Application

PRODUCING ANTRACHITIC SUBSTANCES.—W. W. Triggs (E. I. du Pont de Nemours and Co.). Aug. 17, 1936. 485,452.

DISTILLATION OF NATURAL GLYCERIDES and preparation of vitamin compositions.—Eastman Kodak Co. Aug. 24, 1935. 485,549.

ELECTRODEPOSITION OF NICKEL-COBALT ALLOYS.—Bozel-Maletra Soc. Industrielle de Produits Chimiques. Oct. 2, 1935. 485,288.

TREATMENT OF FABRICS having a basis of organic derivative of cellulose.—H. Dreyfus, D. Finlayson, and R. G. Perry. Nov. 16, 1936. 485,199.

PROCESS OF MANUFACTURING CORROSION-RESISTANT PRECIPITATION-HARDENABLE CLAD ALUMINIUM ALLOYS.—W. H. A. Thiemann (Durener Metallwerke, A.-G.) Nov. 17, 1936. 485,292.

MANUFACTURE AND PRODUCTION OF FINELY DIVIDED VAT DYES.—Courtaulds, Ltd., and T. H. Morton. Nov. 17, 1936. 485,466.

PROCESS FOR THE MANUFACTURE OF STABLE SOLUTIONS of the polyoxalkyl-isoalloxazines.—A. Carpmael (I. G. Farbenindustrie.) Nov. 17, 1936. 485,569.

MANUFACTURE AND PRODUCTION OF AMINOKETONES.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 18, 1936. 485,377.

MANUFACTURE OF POLYMETHINE DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) Nov. 19, 1936. 485,623.

MANUFACTURE OF POLYMETHINE ALDEHYDES.—W. W. Groves (I. G. Farbenindustrie.) Nov. 19, 1936. 485,624.

ELECTROLYTIC PRODUCTION OF SODIUM and other light metals. E. I. du Pont de Nemours and Co. Nov. 20, 1935. 485,587.

MANUFACTURE OF AZO-DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) Nov. 23, 1936. 485,592.

MANUFACTURE OF ETHERS.—W. J. Tennant (Henkel and Cie, Ges.). Nov. 23, 1936. 485,633.

MANUFACTURE AND PRODUCTION OF VALUABLE LUBRICATING-OILS.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 26, 1936. 485,478.

DEHYDRATION OF SECONDARY AND TERTIARY ALCOHOLS and their carboxylic acid esters.—Naamloze Venootschap de Bataafsche Petroleum Maatschappij. Dec. 23, 1935. 485,485.

ANHYDROUS SODIUM SULPHITE.—R. W. James (Maas Chemical Co., A. R.). Jan. 23, 1937. 485,215.

ETHERIFIED DERIVATIVES OF PENTAHYDROXYFUCHSONE.—Chinoin Gyogyszer es Vegyeszeti Termek Gyara R.T. (Dr. Kereszty and Dr. Wolf.) May 18, 1936. 485,228.

CERAMIC COLOURING MATTERS.—Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. Feb. 3, 1936. 485,493.

MANUFACTURE OF NITROBENZ ALDEHYDES of the di- and poly-arylether series.—J. R. Geigy, A.-G. Feb. 29, 1936. 485,314.

PHENOLALDEHYDE CONDENSATION PRODUCTS.—J. R. Geigy, A.-G. March 19, 1936. 485,230.

TREATMENT OF MATERIALS containing tantalum and/or niobium. W. W. Triggs (Soc. Generale Metallurgique de Hoboken). March 23, 1937. 485,318.

RUBBER HYDROHALIDES and processes of preparing the same.—Reynolds Research Corporation. April 24, 1936. 485,234.

TREATMENT OF COKE for increasing its reactivity.—M. Pourbaix. May 3, 1937. 485,333.

DERIVATIVES OF AROMATIC ORTHO-HYDROXY CARBOXYLIC ACIDS. Winthrop Chemical Co., Inc. May 29, 1936. 485,238.

DYEING OF CELLULOSE ESTERS and ethers.—I. G. Farbenindustrie. May 15, 1936. 485,336.

LOW AND MEDIUM TEMPERATURE CARBONISATION OF FUELS.—Dr. C. Otto and Co., Ges. July 18, 1936. 485,244.

DEACIDIFICATION OF CHROME LEATHER.—I. G. Farbenindustrie. Oct. 31, 1936. 485,254.

PREPARED OF BISULPHITE addition compounds of etherified derivatives of pentahydroxyfuchsone.—Chinoin Gyogyszer es Vegyeszeti Termek Gyara Reszvenytarsasag (Dr. Kereszty and Dr. Wolf), and Z. Foldi. March 9, 1937. 485,266.

## Forthcoming Events

### London.

June 15.—Electrodepositors' Technical Society. Northampton Polytechnic Institute, St. John Street, Clerkenwell, E.C.1. 8.15 p.m.

June 22.—Society for the Study of Alchemy and Early Chemistry. King's College, Strand, W.C.2. 7.30 p.m. Annual Meeting. D. W. Singer, "The Name of Plato in Alchemy."

### Newcastle.

June 15.—Society of Glass Technology. County Hotel. 2 p.m. Ordinary General Meeting. R. W. Douglas, "A Note on the Calculation of Rates of Displacement in Viscous Bodies under Applied Stress"; E. J. Gooding, "The Use of Standard Discs in the Strain Testing of Glass Ware"; Professor W. E. S. Turner and M. Parkin, "Glass Fire-Finishing Processes."

## Chemical and Allied Stocks and Shares

SINCE the beginning of the new Stock Exchange account firmer conditions have ruled in the market for industrial and kindred shares, and securities of companies associated with the chemical and allied companies have shown moderate movements in favour of holders.

Distillers, which were down to 94s. at one time have since improved to 95s., and are unchanged on balance for the week, aided by continued talk in the market of a moderate increase in the dividend. Imperial Chemical at 29s. 6d. are 6d. higher on the week, and British Oxygen were a firmer market, awaiting news as to the forthcoming issue of preference shares. The ordinary shares of the latter company have improved from 65s. 7½d. to 66s. 3d. at the time of writing. Fison Packard and Prentice were maintained around 33s. 9d. and Cooper McDougall and Robertson were unchanged at 29s. 4½d., although not much business was reported in these shares.

Pinchin Johnson were steady around 28s. 6d., and are unchanged on balance, while International Paint and Indestructible Paint were also steady. Goodlass Wall changed hands at 9s. Reckitt and Sons transferred up to 105s. British Glues 4s. shares were dull, but few sellers were reported and the current price has been retained at 5s., there being hopes that the dividend may be maintained. British Drug Houses at 22s. 6d. remained at the lower price made in the previous week, and British Match were 31s. 3d. Lever and Unilever ordinary shares remained an active market, and despite moderate fluctuations, are 36s. 10½d. at the time of writing, or the same as a week ago. Barry and Staines were in request and have improved to 38s. 3d., but Michael Nairn made the moderately lower price of 57s. Wall Paper deferred have reacted further to 35s. Associated Portland Cement declined to 75s., but British Plaster Board were in request and have improved moderately to 27s. 3d. in response to hopeful dividend estimates current in the market.

Boots Pure Drug were little changed at 39s. 3d., the disposition being to continue to await the statements at the meeting. Turner and Newall were reactionary and have moved down

to 75s. 7½d., although the maintenance of the interim payment was in accordance with general expectations. Calico Printers, Bleachers and most shares of leading textile companies were dull and inactive. Courtaulds have continued to fluctuate, awaiting the interim dividend announcement, due next month. Despite the less active conditions prevailing in the rayon trade, the general assumption is that the interim will be kept at 3½ per cent., although it is realised that if this proves the case it cannot be taken for granted that the total payment for the year will be maintained. B. Laporte were dull and the list price was again 87s. 6d. Greiff-Chemicals Holdings 5s. units have transferred around 6s. 3d. and Monsanto Chemicals 5½ per cent. preference shares were again quoted at 22s. 6d. William Blythe 3s. shares are quoted at 5s. 3d. and British Tar Products 5s. shares at 10s. 3d.

General Refractories 10s. shares had a steady appearance at 13s., but United Glass Bottle were rather lower at 45s. and Triplex Safety Glass have reacted sharply to 36s. at the time of writing, although this represents some improvement on the price ruling at the end of last week. Lancegate Safety Glass 1s. shares were quoted at 2s. Low Temperature Carbonisation 2s. units were little changed at 2s. 4½d. The market is prepared for only a moderate dividend from the latter company, as the directors may decide to follow a more conservative policy. On the other hand, it is assumed that if and when additional capital is required it is likely to be offered to shareholders on favourable or bonus terms.

There has been a rather better tendency in shares of iron, steel and allied companies, the excellent dividend announcements of Guest Keen and Nettlefolds, Consett Iron, and Whitehead Iron and Steel having tended to draw more attention to the large yields now obtainable on leading shares in this section.

Oil shares were active, recent dividend announcements also having been a favourable influence in this case. The statements at the "Shell" meeting are being awaited with considerable interest for any references to the general outlook for the oil industry.

## Weekly Prices of British Chemical Products

FOLLOWING a quiet re-opening the market in general chemicals has again settled down to steady trading conditions, and there has been a fair volume of inquiry for small parcels to meet immediate or nearby requirements. The tone of the market is regarded as satisfactory for the period although so far as fresh contract business is concerned there is much room for improvement. Values continue very steady and prices remain unaltered as quoted last week. The demand for coal tar products has again been restricted to a few inquiries for odd lots and apart from a certain amount of speculative activity conditions remain exceedingly slow. Quotations for most items are on a nominal basis.

MANCHESTER.—Business in all descriptions of chemical products on the Manchester market during the past week has been decidedly under the influence of the holidays, and the attend-

ance on the Royal Exchange was poor. Few fresh orders of any consequence have been reported, and with consuming establishments shut down for varying periods, deliveries against contracts have been no more than moderate, especially of the textile chemicals, the movement of which leaves much to be desired. The demand for the tar products has remained quiet and business has been confined to odd parcels, although it is possible occasionally to hear somewhat more cheerful talk of the outlook. At the moment the undertone in several sections appears to be a trifle steadier and not much

### Price Changes

**Rises:** Cresylvic Acid, pale 99/100%.

**Falls:** Lead Acetate, white and brown (Manchester); Potassium Chlorate (Manchester); Carbolic Acid, crystals (Manchester); Cresylvic Acid, dark, 95%.

further easiness has developed.

GLASGOW.—Business in general chemicals has been rather quiet since our last report, both for home trade and export. Prices, however, continue quite steady at about previous figures, with no important changes to report.

### General Chemicals

ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech., 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lanes GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10 1/2d. to 1s. 0 1/2d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2 1/2d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £19 per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Sal ammoniac.)

AMMONIUM DICHROMATE.—8d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r. mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 3 1/2d. per lb. d/d station in 70-lb. cylinders (1-ton lots).

CHROMETAN.—Crystals, 2 1/2d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2 1/2%; d/d U.K.

CHROMIUM OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0 1/2d. per lb. MANCHESTER: 1s. 0 1/2d. SCOTLAND: B.P. crystals, 1s. 0 1/2d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £18 per ton f.o.b. SCOTLAND: £18 10s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2 1/2%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £4 2s. 6d. to £5 2s. 6d. per cwt. according to quantity; in drums, £3 15s. 0d. to £4 7s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35.

GLASGOW: White crystals, £30; brown, £1 per ton less.

MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2 1/2% carriage paid. SCOTLAND: £31 per ton, less 2 1/2% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2 1/2%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. per lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 1d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 1d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3 1/2d. per lb.

POTASH CAUSTIC.—Solid, £35 5s. to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £38 10s.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4 1/2d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5 1/2d. per lb. carriage paid. SCOTLAND: 5 1/2d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9 1/2d. per lb. SCOTLAND: B.P. Crystals, 9 1/2d. MANCHESTER: B.P. 10 1/2d. to 1s.

POTASSIUM PRUSSIATE.—6 1/2d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6 1/2d. to 6 1/2d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6 1/2d. per lb. net, ex store.

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

**SODA, CAUSTIC.**—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

**SODA CRYSTALS.**—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

**SODIUM ACETATE.**—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

**SODIUM BICARBONATE.**—Refined spot, £10 15s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

**SODIUM BISULPHITE POWDER.**—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

**SODIUM CARBONATE MONOHYDRATE.**—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

**SODIUM CHLORATE.**—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

**SODIUM DICHROMATE.**—Crystals cake and powder 4d. per lb. net d/d U.K. with rebarbs for contracts. MANCHESTER: 4d. per lb. GLASGOW: 4d. net, carriage paid.

**SODIUM HYPOSULPHITE.**—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

**SODIUM METASILICATE.**—£14 5s. per ton, d/d U.K. in cwt. bags.

**SODIUM NITRATE.**—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 6d. per cwt. in 1-cwt. kegs, net, ex store.

**SODIUM NITRITE.**—£18 5s. per ton for ton lots.

**SODIUM PERBORATE.**—10%, 9d. per lb. d/d in 1-cwt. drums.

**SODIUM PHOSPHATE.**—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £15 to £16 per ton delivered per ton lots.

**SODIUM PRUSSIATE.**—d. per lb. for ton lots. GLASGOW: 5d. to 5d. ex store. MANCHESTER: 4d. to 5d.

**SODIUM SILICATE.**—£8 2s. 6d. per ton.

**SODIUM SULPHATE (GLAUBER SALTS).**—£3 per ton d/d.

**SODIUM SULPHATE (SALT CAKE).**—Ground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.

**SODIUM SULPHIDE.**—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

**SODIUM SULPHITE.**—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

**SULPHURIC ACID.**—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

**SULPHURIC ACID.**—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

**TARTARIC ACID.**—1s. 1d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1d. to 1s. 1d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.

**ZINC SULPHATE.**—Tech., £11 10s. f.o.r., in 2 cwt. bags.

### Rubber Chemicals

**ANTIMONY SULPHIDE.**—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7d. per lb.

**ARSENIC SULPHIDE.**—Yellow, 1s. 5d. to 1s. 7d. per lb.

**BARYTES.**—£6 to £6 10s. per ton, according to quality.

**CADMIUM SULPHIDE.**—4s. 3d. to 4s. 6d. per lb.

**CARBON BLACK.**—3d. to 3 1/16d. per lb., ex store.

**CARBON DISULPHIDE.**—£31 to £33 per ton, according to quantity. drums extra.

**CARBON TETRACHLORIDE.**—£41 to £46 per ton, according to quantity. drums extra.

**CHROMIUM OXIDE.**—Green, 10d. to 11d. per lb.

**DIPHENYLQUANTININE.**—2s. 2d. per lb.

**INDIA-RUBBER SUBSTITUTES.**—White, 4d. to 5d. per lb.; dark 3d. to 4d. per lb.

**LAMP BLACK.**—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

**LEAD HYPOSULPHITE.**—9d. per lb.

**LITHOPONE.**—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

**SULPHUR.**—£9 to £9 5s. per ton. **SULPHUR PRECIP. B.P.**, £55 to £60 per ton. **SULPHUR PRECIP. COMM.**, £50 to £55 per ton.

**SULPHUR CHLORIDE.**—5d to 7d. per lb., according to quantity.

**VERMILION.**—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.

**ZINC SULPHIDE.**—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

### Nitrogen Fertilisers

**AMMONIUM SULPHATE.**—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

**CALCIUM CYANAMIDE.**—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.

**NITRO CHALK.**—£7 10s. 6d. per ton up to June 30, 1938.

**SODIUM NITRATE.**—£8 per ton for delivery up to June 30, 1938.

**CONCENTRATED COMPLETE FERTILISERS.**—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

**AMMONIUM PHOSPHATE FERTILISERS.**—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

### Coal Tar Products

**BENZOL.**—At works, crude, 9d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3d.; 90%, 1s. 4d. to 1s. 4d.; pure, 1s. 8d. to 1s. 8d. GLASGOW: Crude, 10d. to 10d. per gal.; motor, 1s. 4d. to 1s. 4d. MANCHESTER: Pure, 1s. 7d. to 1s. 8d. per gal.; crude, 11d. to 1s. per gal.

**CARBOLIC ACID.**—Crystals, 7d. to 8d. per lb., small quantities would be dearer; Crude, 60's, 2s. 9d. to 3s.; dehydrated, 3s. to 3s. 3d. per gal. MANCHESTER: Crystals, 7d. per lb. f.o.b. in drums; crude, 2s. 2d. to 2s. 5d. per gal.

**CREOSOTE.**—Home trade, 5d. per gal., f.o.r. makers' works; exports, 6d. to 6d. per gal., according to grade. MANCHESTER: 4d. to 5d. GLASGOW: B.S.I. Specification, 6d. to 6d. per gal.; washed oil, 5d. to 5d.; lower sp. gr. oils, 5d. to 6d.

**CRESYLIC ACID.**—97/99%, 2s. to 2s. 3d.; 99/100%, 3s. 6d. to 5s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 2d. to 2s. 7d.; Dark, 95%, 1s. 8d. to 1s. 10d. per gal.

GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 2s. 9d.

**NAPHTHA.**—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6d. to 7d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

**NAPHTHALENE.**—Crude, whizzed or hot pressed, £5 5s. to £6 5s. per ton; purified crystals, £14 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £6 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £15 per ton f.o.b.

**PITCH.**—Medium, soft, 3s. per ton, f.o.b. MANCHESTER: 32s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

**PYRIDINE.**—90/140%, 13s. 6d. to 15s. per gal.; 90/160%, 10s. 6d. to 13s. 3d. per gal.; 90/180%, 3s. 3d. to 4s. per gal. f.o.b. GLASGOW: 90%, 140, 10s. to 12s. per gal.; 90%, 160, 9s. to 10s.; 90%, 180, 2s. 6d. to 3s. MANCHESTER: 10s. to 11s. 6d. per gal.

**TOLUOL.**—90%, 1s. 10d. per gal.; pure, 2s. 2d. GLASGOW: 90%, 120, 1s. 10d. to 2s. 1d. per gal.

**XYLOL.**—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

### Wood Distillation Products

**CALCIUM ACETATE.**—Brown, £7 5s. to £9 15s. per ton; grey, £9 5s. to £9 15s. MANCHESTER: Brown, £8 10s.; grey, £10.

**METHYL ACETONE.**—40.50%, £35 to £40 per ton.

**WOOD CREOSOTE.**—Unrefined, 4d. to 6d. per gal., according to boiling range.

**WOOD NAPHTHA, MISCELL.**—3s. 3d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.

**WOOD TAR.**—£2 to £8 per ton, according to quality.

### Intermediates and Dyes

**ANILINE OIL.**—Spot, 8d. per lb., drums extra, d/d buyer's works.

**ANILINE SALTS.**—Spot, 8d. per lb. d/d buyer's works, casks free.

**BENZIDINE, HCl.**—2s. 7d. per lb., 100% as base, in casks.

**BENZOIC ACID, 1914 B.P. (ex toluol).**—1s. 11d. per lb. d/d buyer's works.

**m-CRESOL 98/100%.**—1s. 8d. to 1s. 9d. per lb. in ton lots.

**o-CRESOL 30/31° C.**—6d. to 7d. per lb. in 1-ton lots.

**p-CRESOL 34-5° C.**—1s. 7d. to 1s. 8d. per lb. in ton lots.

**DICHLORANILINE.**—2s. 1d. to 2s. 5d. per lb.

**DIMETHYLANILINE.**—Spot, 7d. per lb., package extra.

**DINITROBENZENE.**—8d. per lb.

**DINITROCHLORBENZENE, SOLID.**—£79 5s. per ton.

**DINITROTOLUENE.**—48/50° C., 9d. per lb.; 66/68° C., 11d.

**DIPHENYLAMINE.**—Spot, 2s. 2d. per lb., d/d buyer's works.

**GAMMA ACID.**—Spot, 4s. 4d. per lb. 100% d/d buyer's works.

**H ACID.**—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

**NAPHTHONIC ACID.**—1s. 10d. per lb.

**β-NAPHTHOI.**—£97 per ton; flake, £94 8s. per ton.

**α-NAPHTHYLAMINE.**—Lumps, 1s. 1d. per lb.

**β-NAPHTHYLAMINE.**—Spot, 3s. per lb.; d/d buyer's works.

**NEVILLE AND WINTHROP'S ACID.**—Spot, 3s. 3d. per lb. 100%.

**o-NITRANILINE.**—4s. 3d. per lb.

**m-NITRANILINE.**—Spot, 2s. 10d. per lb. d/d buyer's works.

**p-NITRANILINE.**—Spot, 1s. 10d. to 2s. 3d. per lb. d/d buyer's works.

**NITROBENZENE.**—Spot, 4d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

**NITRONAPHTHALENE.**—10d. per lb.; P.G., 1s. 0d. per lb.

**SODIUM NAPHTHONATE.**—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

**SULPHANILIC ACID.**—Spot, 8d. per lb. 100%, d/d buyer's works.

**o-TOLUIDINE.**—11d. per lb., in 8/10-cwt. drums, drums extra.

**p-TOLUIDINE.**—2s. per lb., in casks.

**m-XYLIDINE ACETATE.**—4s. 8d. per lb., 100%.

## Company News

**Whitehead Iron and Steel Co., Ltd.**, recommend the payment of a final dividend of 12½ per cent., and a cash bonus of 10 per cent., less tax, making a total payment of 35 per cent. for the year ended March 31. In the previous financial year similar payments were accompanied by a capital bonus of 25 per cent.

**Yorkshire Dyeware and Chemical Co.**, in their report for the year to March 31 show profit of £38,615 (£37,264); less interest on debenture stock. Final of 5 per cent., making 10 per cent. on larger capital (same); cash bonus 6½ per cent. (10 per cent. and 25 per cent. capital bonus); research fund, £2,000 (£1,500); reserve fund, £3,000 (nil); forward, £7,615 (£7,581).

**British Bemberg, Ltd.**, following the failure of British Bemberg, Ltd., to meet interest payments on the 6 per cent. debentures which are held in Holland, a report on the financial position of the company states that on March 27 last, assets amounted to £792,100 and liabilities to £404,500. The difference represents the ordinary capital of £200,000, the reserve created by the reduction of principal of the 6 per cent. debentures, less the loss of £48,700.

**Turner and Newall, Ltd.**, asbestos goods manufacturers, are again paying an interim dividend of 3½ per cent., less tax, on the £5,328,448 ordinary stock. For the year to September 30 last a final of 16½ per cent. brought the total distribution to 20 per cent. The announcement of the final dividend usually made at the end of November will, this year and in future, be made approximately three weeks later, in order to allow more time to the branch and subsidiary companies for the preparation of their accounts.

**Celanese Corporation of America** has decided to take no action in respect of the \$3.50 half-yearly dividend due June 30 on the \$14,817,900 of 7 per cent. participating preferred stock. The regular quarterly payment on the \$16,481,800 7 per cent. prior preferred stock will be made on July 1 to holders of record June 17. Early this month the directors stated that, "subject to such adjustments as might have been required by an audit of accounts," net profit for first 1938 quarter was \$114,275 after all charges. The prior preferred stockholders were recently invited to approve issue plans for "debentures or other funded obligations of an unsecured nature up to \$20,000,000."

**Boots Pure Drug Co., Ltd.**, announce that the gross profit for the year ended March 31 last is £25,784 lower at £940,332. Net profits come out at £762,626, against £799,899 for the previous year. The ordinary distribution of 29 per cent., including the cash bonus of 5 per cent., tax free, absorbs £464,000. It is proposed to place £50,000 to taxation reserve, while £72,132 goes to freehold property reserve, against £20,251, and £33,228 to overseas development fund, against £50,000. Works development reserve receives £16,772, whereas a year ago contingencies reserve received £50,000, and general reserve £100,000. The carry-forward is £346,730, against £316,987 brought in. The report states that the company's holdings of Government securities have now been finally disposed of, resulting in a capital profit of £56,140. The directors recommend that from this sum a special cash distribution of 2d. per share, tax free, be made to ordinary shareholders on May 5, and that the balance be divided among the various Boots' benevolent funds at the directors' discretion. The balance sheet shows investments at £947,191, compared with £1,036,932 for the previous year. Cash is £13,405, against £90,680, while debtors are shown at £205,397, against £175,506, and creditors at £864,204, against £834,455. Stocks stand at £960,899 in comparison with £896,887.

**B. Laporte, Ltd.**, in their report for the year ended March 31 last, state that the company has experienced an increase of turnover, both at home and abroad during the period under review. There has been a slight increase in the net trading profit, and an increase in the amount received from investments during the past financial year, as compared with the previous year. An amount of £2,036, received in respect of sale of patent rights and other matters, has been credited to capital reserve account. The wholly-owned subsidiary, the Malehurst Barytes Co., Ltd., has now repaid the balance of the loan of £8,000, shown in the previous accounts. Additional sums have been invested in preference shares in National Titanium Pigments, Ltd., and an outside interest of both preference and ordinary shares in this subsidiary company, was acquired during the year. The whole of the preference capital and a majority of the ordinary share capital in this subsidiary is now held by your company. Further amounts have been invested in Crystal-Laporte Proprietary, Ltd., the new subsidiary company in Australia, referred to in the previous report, which has now completed erection of the new buildings and plant, and will shortly enter into production of hydrogen peroxide for the Australian market. As trading has not yet commenced, no dividend has been received in respect of the company's investment in this subsidiary. The profit for the year, including dividends and interests received from investments, after charging directors' fees, making provision for depreciation and doubtful debts, and providing a sum for obsolescence, amounts to £94,229, as against £92,211 for the previous year.

## New Companies Registered

**F. C. Green, Ltd.** 340,565.—Private company. Capital £1,000 in 1,000 ordinary shares of £1 each. To carry on the business of manufacturing, dispensing and analytical chemists and druggists, etc. Subscribers: Doris M. Green, 15 Penare Road, Penzance; Fdk. C. Green.

**Oakes Eddon and Co., Ltd.** 340,539.—Private company. Capital £300 in 300 shares of £1 each. To carry on the business of laboratory furnishers, dealers in fine chemicals, chemists, druggists, oil and colour men, etc. Directors: John A. Hall, 66 Addingham Road, Liverpool; Edward A. Eddon, William J. Oakes. Registered office: 110 Wood Street, Liverpool.

**Scientific Glassblowing Company, Ltd.** 340,541.—Private company. Capital £2,000 in 1,600 ordinary shares of £1 and 8,000 founders' shares of 1s. To acquire the business of a glassblower and maker of chemical and physical apparatus carried on by Paul Priem at 95 Gray's Inn Road, W.C.1. Directors: Paul A. J. Priem, 48 Balmoral Road, South Harrow; Wm. R. A. Priem; Martin Priem; Victor Priem.

**Bentley, Johnson and Duxbury, Ltd.** 340,235.—Private company. Capital £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in gas decontaminating appliances, apparatus and supplies, gas masks, and respirators, etc. Directors: Jas. C. Bentley, 56 Brownhill Road, Blackburn; Harold Duxbury, Fred Johnson. Registered office: 3 Calendar Street, Blackburn.

**E. B. Badger and Sons (Great Britain), Ltd.** 340,527.—Private company. Capital £1,000 in 1,000 shares of £1 each. To carry on the business of installers of and operators of plant and machinery for distilling, refining, extracting, recovering and purifying petroleum, alcohol and beverages, solvents, by-product coke and wood chemicals and synthetic and other chemicals, etc. Subscribers: F. Wasserman, 5 Fordwich Court, Shoot-up-Hill, Cricklewood, N.W.2; L. Walsh.

**Alkan and Lowe, Ltd.** 340,425.—Private company. Capital £1,000 in 1,000 shares of £1 each. To carry on the business of manufacturers, merchants and agents in all kinds of grinding, polishing and electroplating plant, chemicals requisites and sundries, and all grinding, polishing and degreasing materials, metal salts and lacquers and also all machinery in connection therewith, etc. Directors: Max Alkan, 9 Courtleigh Bridge Lane, N.W.11; James Lowe. Registered office: 11 Leverington Street, Clerkenwell, E.C.1.

**Decaron Syndicate, Ltd.** 340,482.—Private company. Capital £300 in 6,000 shares of 1s. each. To adopt an agreement with Arthur T. du Valon Green, and to carry on the business of manufacturers of petroleum, petrol, oils, spirits, colloidal fuel and other substances from any mineral (including all coals and mineral oil) whether of a petrolierous nature or not, by synthesis, by any process of amalgamation, distillation or otherwise, etc. Directors: John F. Snow, Copse Side, Longfield, Kent; Hettie Craig-Kelly; Arthur T. du Valon Green.

**The Premier Coal-Oil Development Plant, Ltd.** 340,216.—Private company. Capital £35,000 in 35,000 ordinary shares of £1 each. To carry on the business of manufacturers, producers, distillers and importers of and dealers in oils, lubricants, greases, tallow, petrol, paraffin, benzol, motor spirit, tar, bitumen, petroleum, wax, beeswax and oil and other fuels; to acquire and maintain factories, plant, etc. Subscribers: Violet A. Tanner, 11 Old Jewry, E.C.; Winifred F. Jarraway. Registered office: 20-21 Tooks Court, Cursitor Street, E.C.4.

**Natural Fertiliser (Dominions and Colonies), Ltd.** 340,374.—Private company. Registered May 17. Capital £3,500 in 3,000 6 per cent. participating preference shares of £1 and 10,000 ordinary shares of 1s. Objects: To carry on the business of manufacturers of preparations for the enrichment of the soil, and animal feeding stuffs, and of aids and remedies of all kinds for agricultural fruit growing or other purposes, etc. The directors are: Lord Cecil C. Douglas, 32 Grosvenor Street, W.1 (director of Inter-Counties Construction Co., Ltd.); Georges Magnien, 13 Rue des Poissonniers, Brussels (director of Natural Fertiliser (Holdings), Ltd.); and Thomas F. Grundy, "Rotorua," Higher Drive, Banstead, Surrey (director of Status Issue Corporation, Ltd., and Trent Investment Co., Ltd.). Secretary: F. J. Palmer. Registered office: 12 Nicholas Lane, E.C.4.

**Appliances for Resuscitation Purposes, Ltd.** 340,191.—Private company. Capital £1,000 in 900 6 per cent. non-cumulative preferred ordinary shares of £1 each and 1,000 deferred ordinary shares of 2s. each. To carry on the business of manufacturers of and dealers in apparatus for resuscitation of human life, particularly in cases of poisoning by gases, fumes, smoke or fire, and of suffocation, asphyxiation, accident by drowning and collapse owing to natural causes; manufacturers of and dealers in soda lime, caustic soda and other chemical substances used in connection with the absorption of moisture or carbon dioxide, and clothing, fabric and other materials which are fire-resistant and capable of resisting natural elements and are rendered immune from fire; air filters, gas masks, etc. Subscribers: J. R. Beckensall, 29 Alwyne Villas, Canonbury, N.1; F. R. Saunders.

